

THE
PRACTICAL
REQUIREMENTS
OF
MODERN
BUILDINGS

EUGENE CLUTE

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View of the Sanctuary, St. Gregory's Church, Brooklyn, New York
Helmle & Corbett, Architects

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of
MODERN BUILDINGS

By
EUGENE CLUTE

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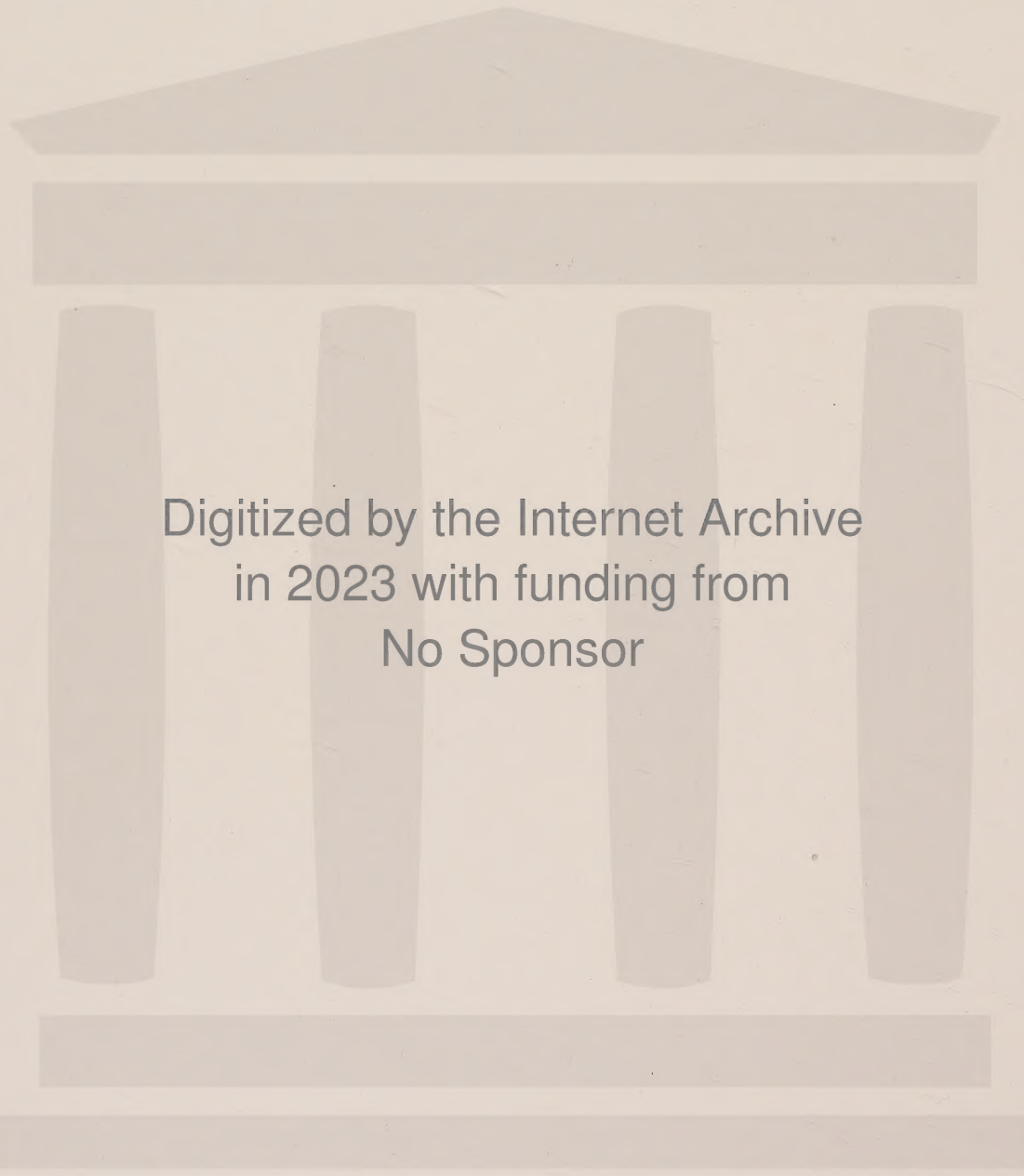
P R E F A C E

THE purpose of this book is to present as clear a mental picture as possible of the practical requirements of all kinds of modern buildings that the architect is likely to be called upon to design. In order that the salient points may not be obscured by the usual mass of detail, attention has been centered upon the essential requirements common to all buildings intended to serve one special purpose, rather than upon the peculiarities of individual cases, as a rule. It is believed that this book tells briefly the purpose of each kind of building, what operations are performed within it, and what those who use a building for a given purpose demand of that building. The problem of the practical requirements of a building once laid bare and understood is at least half solved. But the man who knows most about the type of building in question seldom tells the things the architect wants to know; he often regards the information that is most needed as a matter of general knowledge, forgetting that he has specialized until the technical practices or the business or industrial methods of his world have become second nature to him.

The habit of taking these things concerning their particular trades or professions for granted is so firmly fixed in most men that they cannot get a sufficiently detached view to enable them to explain the needs of the theatre, hospital, dairy, or other proposed building, to the architect. The aim of the author has been to secure this kind of information and to present it in convenient form in this book for the use of architects, draftsmen, and students.

EUGENE CLUTE

New York City, 1928.



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The French Hospital, New York City
Crow, Lewis & Wick, Architects

CHAPTER I

HOSPITALS

MORE attention is being given now than ever before to making each hospital fit the requirements of the service which it must provide. A standardized hospital can not serve the peculiar needs of each community. Each institution has its own work to do in its own way and the building must be adapted to these conditions.

A plan that is highly satisfactory in one hospital may be all wrong in another. It is for this reason that the common practice of sending out representatives of the board of a hospital to study hospitals, with the thought of incorporating ideas from here and there in the new hospital the board is to have built, is of little value. These representatives are usually without a general perspective of hospital matters and are apt to become impressed with various features of the hospitals they visit and decide to have these things incorporated in the hospital under their control, without realizing that possibly these features which

they desire may not be desirable or necessary in this hospital and may involve useless expenditure.

The architect should have, or acquire, a good knowledge of the conduct of hospital work, and he should be sufficiently well informed to be able to consult intelligently with the board, the superintendent, and heads of departments of the hospital which he is to design, and to guide them when necessary. Hospital people expect the architect to translate their requirements into architecture, to give them a practical working building of good appearance.

The architect who has a knowledge of the basic requirements of all kinds of hospital work is able to see the particular hospital he has under consideration as a part of hospital activities in general, and since he is able to take a detached view, and should have a broad knowledge of hospital problems and equipment, he is likely to have a better sense of proportion than the people who are



Entrance Lobby of the Englewood Hospital, Englewood, N. J.
Crow, Lewis & Wick, Architects

THE PRACTICAL REQUIREMENTS



Main Operating Room, Englewood Hospital,
Englewood, N. J.
Crow, Lewis & Wick, Architects



Englewood Hospital, Englewood, N. J.
Crow, Lewis & Wick, Architects



Paterson General Hospital, Paterson, N. J.

Crow, Lewis & Wick, Architects

thoroughly identified with a single hospital and who have become imbued with more or less fixed ideas.

In the first place, of course, there are special hospitals, maternity, eye-and-ear, neurological, etc., each with its highly specialized requirements. Then there are the general hospitals and these must differ widely, due to the nature of the community served and the proportions of the various services which must be afforded. If a hospital is in a location where it receives many accident cases, people injured in a manufacturing plant for instance, it requires special facilities for taking care of these cases. In most communities the maternity department is an especially important feature, and the demand for this kind of hospital service is increasing rapidly. In some industrial communities the most important work of a hospital may lie in the improvement of living conditions, hygiene, disease prevention and in combating occupational diseases. In doing this it makes use of social service, which insures consultations, of special lectures on dietetics, on hygiene and on existing disorders produced by some occupations.

An out-patient department provides for an important part of a hospital's activities in that it affords service to those unable to pay for equally good care and advice as private patients, and such a department enables a hospital to treat at a lower

cost to the hospital many cases which would otherwise have to be admitted to the hospital.

There is an increasing tendency to regard a hospital as a means of conserving the health of the community, through caring for people who are ailing and preventing their state of health from becoming such as to require their admission to a hospital. Clinics and out-patient departments in general are becoming more highly important features of hospital work. It has happened quite frequently in the last few years that the out-patient department of a fine new hospital has proved inadequate to the needs of the institution, through the failure of the hospital board and the architects to provide ample facilities for this work when the building was designed.

Another trend in the hospital field is towards the building of special hospitals, maternity, gynecological, orthopedical, neurological, etc., instead of having special departments in general hospitals. This is being done in order to avoid the duplication of equipment and in order to secure the highest degree of effectiveness by thorough specialization. It is, for instance, much better to have a good neurological hospital rather than neurological departments in several hospitals in the same city.

There is also a tendency towards the grouping of special hospitals together with facilities for



Bayonne Hospital, Bayonne, N. J.

Crow, Lewis & Wick, Architects

training doctors, dentists, and nurses in a single great organization. An outstanding example of this is the new Columbia-Presbyterian Medical Center in New York City, of which Dr. C. C. Burlingame is executive head. This group includes the following units: the Presbyterian Hospital and School of Nursing, the Vanderbilt Clinic, the Sloane Hospital, the Squier Clinic and the Neurological Institute, by James Gamble Rogers, Inc., and the Babies' Hospital, by Henry C. Pelton and James Gamble Rogers, associate architects. The New York State Psychiatric Hospital adjoining is by Sullivan Jones, formerly New York State Architect.

The arrangement of the units of the medical center is as follows: the College of Physicians and Surgeons is at the north with a link connecting it with the Presbyterian Hospital, the Vanderbilt Clinic and the Squier Urological Clinic and the Neurological Hospital. The Babies' Hospital is at the south and the State Psychiatric Hospital is at the west, along Riverside Drive. It is clear that this arrangement coordinates the forces for the maintenance of the public health, since it brings the students of the College of Physicians and Surgeons into direct contact with a great group of hospitals, affording unusually good opportunities for study and observation, and it acquaints the student doctors, dentists and nurses with each other's requirements during their years of training so that they may co-operate most effectively later in their graduate practice.

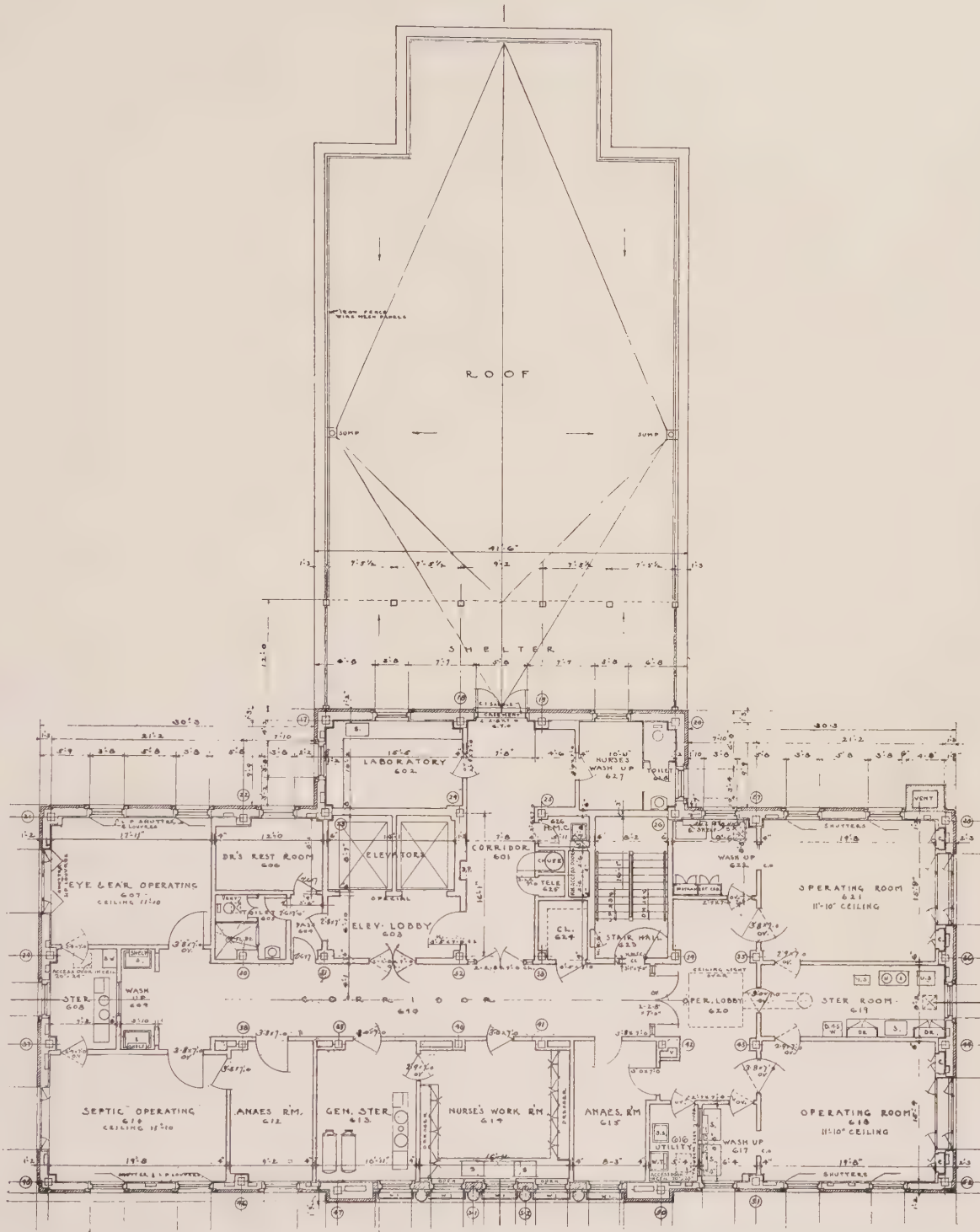
So large and complex an organization as this is might easily prove unwieldy under central control, but this danger has been avoided in the

case of the Columbia-Presbyterian Medical Center by substituting central service for central control. Each division is autonomous, it runs itself with only general direction from the administrative center and each division is served by the facilities of the general organization. This principle is carried down through the divisions. For instance, the Presbyterian Hospital instead of being one great hospital consists of a number of relatively small hospital units, each occupying a floor of the building and so organized that responsibility is definitely fixed and quick action administration assured. Also, this subdivision of control brings about a more friendly atmosphere, puts more of the human quality into the work than is usual where there is central control remote from the various divisions of the institution. All of these matters of hospital organization and practice are important to the architect for they are the things back of the requirements of the hospital board, the requirements that his building must meet.

Clearly, the architect needs to inquire carefully into the nature of the work the particular hospital he is about to design is intended to accomplish, to study this work with the hospital people; the superintendent, superintendent of nurses, dietitian and other heads of hospital departments, hearing what they have to say, often leading them into a more accurate perception of some matters and to a sense of the proportion of each department to the whole hospital, and always forming his own conclusions.

In addition to this, the architect needs to study the technique of the particular hospital organization. Hospitals differ considerably in the way

OF MODERN BUILDINGS



Operating Floor, The Bayonne Hospital, Bayonne, N. J.
Crow, Lewis & Wick, Architects

they do things. This is due partly to the nature and training of the person or persons who established the method of working, and partly to the conditions under which the staff has become accustomed to working. For instance, not a few hospitals have had their origin in buildings that were originally residences and the staff has developed a technique that was workable under these conditions; this has become the established technique of that particular hospital organization and often it is good. Whatever the technique of the staff is, it is the architect's business to become acquainted with it. It will be carried into the new building, though perhaps in a modified form. Features of the technique that are not good, but that have been employed through force of habit or of circumstances, should be eliminated and better methods substituted. It is not well, usually, to attempt to discard the old technique entirely. The architect should go into this matter in his conferences with the hospital people in order that the new building may be adapted to the technique that definitely is to be employed. Even when the hospital is a new organization the technique is sure to be largely old, for the elements of it are brought by the superintendent, the supervisor of nurses and others from the several hospitals in which they were trained or with which they have been connected; also it is sure to have a considerable degree of individuality.

Probably the best method of getting a grasp of the requirements, after the inquiry already recommended has been made, is to consider just what is to happen in this hospital, the admission of different classes of patients, their care, the handling of visitors and out-patients.

There are certain requirements that are more or less fixed, and met with in all cases, for example, the doors to private rooms must be at least 3 ft. 5 in. wide in the clear, to permit a bed to pass, but this is a proper minimum and 3 ft. 8 in. is a good width. Such doors may be 4 ft. wide, but 4 ft. is wider than is really necessary and doors of this width are unnecessarily clumsy and expensive. The doors of operating rooms and of treatment rooms and labor rooms and delivery rooms should be 4 ft. wide, and never less than 3 ft. 8 in. Double doors should be avoided on operating rooms as they are troublesome to use. It is better to provide single doors of adequate width.

The elevators that are to be used in taking patients from a room or ward to an operating room must be large enough to accommodate a bed or a wheeled stretcher, a nurse, attendant and an elevator man—6 ft. x 8 ft. is a good size. Freight elevators, which are used for carrying the food carts, equipment, etc., may be as small as 6 ft. x 6 ft. It is well to have all of the passenger elevators large enough to take a bed or a stretcher, that is 6 ft. x 8 ft., in order that any of them may be used for this purpose on occasion.

In front of the elevators on each floor there should be an elevator lobby somewhat larger than the combined floor area of the elevators it serves, so that the unpreventable noises of the elevator mechanism and doors are not allowed to escape into the corridors and patients' rooms. This lobby also provides a space in which persons waiting for the elevators may stand out of the way of the traffic in the corridors. This lobby should be enclosed with partitions.

The corridors leading to wards and those in the private room section of a hospital should be at least 8 ft. wide, which is a good standard width. This will permit two stretchers to pass and take care of the traffic in general. Where corridors are unusually long, however, they should be made a little wider than this. The through traffic must be taken into account and the visitors, as well as the movement of patients on stretchers, the ambulant patients, the doctors, nurses, internes, and orderlies. The amount of traffic needs to be gauged in each case but, usually, 8 ft. may be regarded as a sufficient width.

There should be a closet on each floor for one stretcher, perhaps more. A closet 6 ft. x 7 ft. 6 in. will take a stretcher and two wheel chairs. It should have double doors, throwing the entire width open upon the corridor, in order that the stretcher and wheel chairs may be put in and taken out easily.

On a typical ground floor one finds usually the following: Vestibule, entrance lobby, corridors, registration room, men's toilet, women's toilet, waiting room, social service room, record-and-history room, pharmacy, examination rooms and a stair hall. Sometimes there are rooms for a clinic or out-patient department on this floor and sometimes some special department is accommodated there, as in the case of the Paterson General Hospital (see plan on page 10) where the westerly part is given over to the X-ray department.

On a typical private room floor there are usually the following: Elevator lobby, corridors, nurses' station, private rooms, diet kitchen, duty room, toilet rooms, bathrooms, stretcher closet, house maid's closet, linen room, stair hall. Some of the private rooms usually have bathrooms adjoining, while in other cases there is only a wash bowl in the room. There should be a small clothes closet with each private room. A good size for a private room is 12 ft. x 16 ft. and 10 ft. x 15 ft. or 10 ft. x 16 ft. is a satisfactory size.

On a typical surgical floor we find operating rooms, with adjoining wash-up or scrub-up rooms for the doctors, also anesthetizing rooms, a utility room or nurses' room and a small laboratory, if the main laboratory is not easily accessible. There should be a doctors' rest room, a doctors' locker room and toilet, a nurses' wash-up and, sometimes, an office for the operating nurse.

Operating rooms, excepting those for the nose

Maternity Floor, The Bayonne Hospital, Bayonne, N. J.
Crow, Lewis & Wick, Architects

and throat and some other special work, should be at least 14 ft. x 18 ft. The ceiling should be of such height that it will afford an ample volume of air and not look oppressively low—12 ft. is a good minimum height.

The familiar "studio" skylight is being less often used in operating rooms, a straight window in the wall being used instead, although the overhead light is very desirable. This window should extend to the ceiling and in some rooms for special operations must be provided with shutters to exclude daylight on occasion. Some surgeons now prefer to work by artificial light entirely, but in any case there should be a window to admit daylight and air when the room is not in use, and daylight is usually used in operating. The size of an operating room window may be taken as 8 ft. wide, extending from a point about 2 ft. 6 in. above the floor to the ceiling or sometimes with an extension in the ceiling.

There must be a strong electric light over the operating table, especially designed to throw the light deep down into the seat of the operation, and it must not cast a shadow. This fixture must have a gas light or auxiliary electric lamps, supplied from a storage battery, that can be turned on instantly in case of failure of the electric current, a not infrequent contingency.

The operating rooms are usually placed on the top floor because of the better light and because the anesthetic odors emanating from them are unpleasant, also when placed on the top floor the operating rooms are not involved in the general traffic of the hospital. The absolute necessity of placing these rooms at the top of the hospital is removed by the adoption of the straight window in place of the skylight, but this department is usually, on all counts, best placed at the top of the building.

There is no necessity for the customary cold, forbidding appearance of operating rooms, the walls need not be glassy white, to be equally sanitary, and a darker tone eliminates the glare which is distracting to the surgeon. An excellent color scheme for an operating room that has proved entirely satisfactory is a wainscot of tile with a matte surface in a fairly light tone of gray-green, and above this the walls and ceiling painted in a lighter tone of the same color. The floor is of tiles in a darker tone of this same gray-green, or buff. The floor tiles must not be so smooth as to become slippery when wet.

In some operating rooms provision is made for observation on the part of students, and visiting physicians. In the new Presbyterian Hospital, which is part of the Medical Center in New York, certain operating rooms have been provided with observation galleries for the use of students from the adjoining Columbia School of Medicine and Surgery. These galleries are only seven feet above the floor (measured to the under side), are

provided with saddle seats in a single row, so that the students may lean forward practically over the operating table at only a short distance above it, and look down through a glass screen that projects into the room at an angle from the edge of the parapet of the gallery. This glass screen prevents the presence of the students from lessening the asepsis of the operating room.

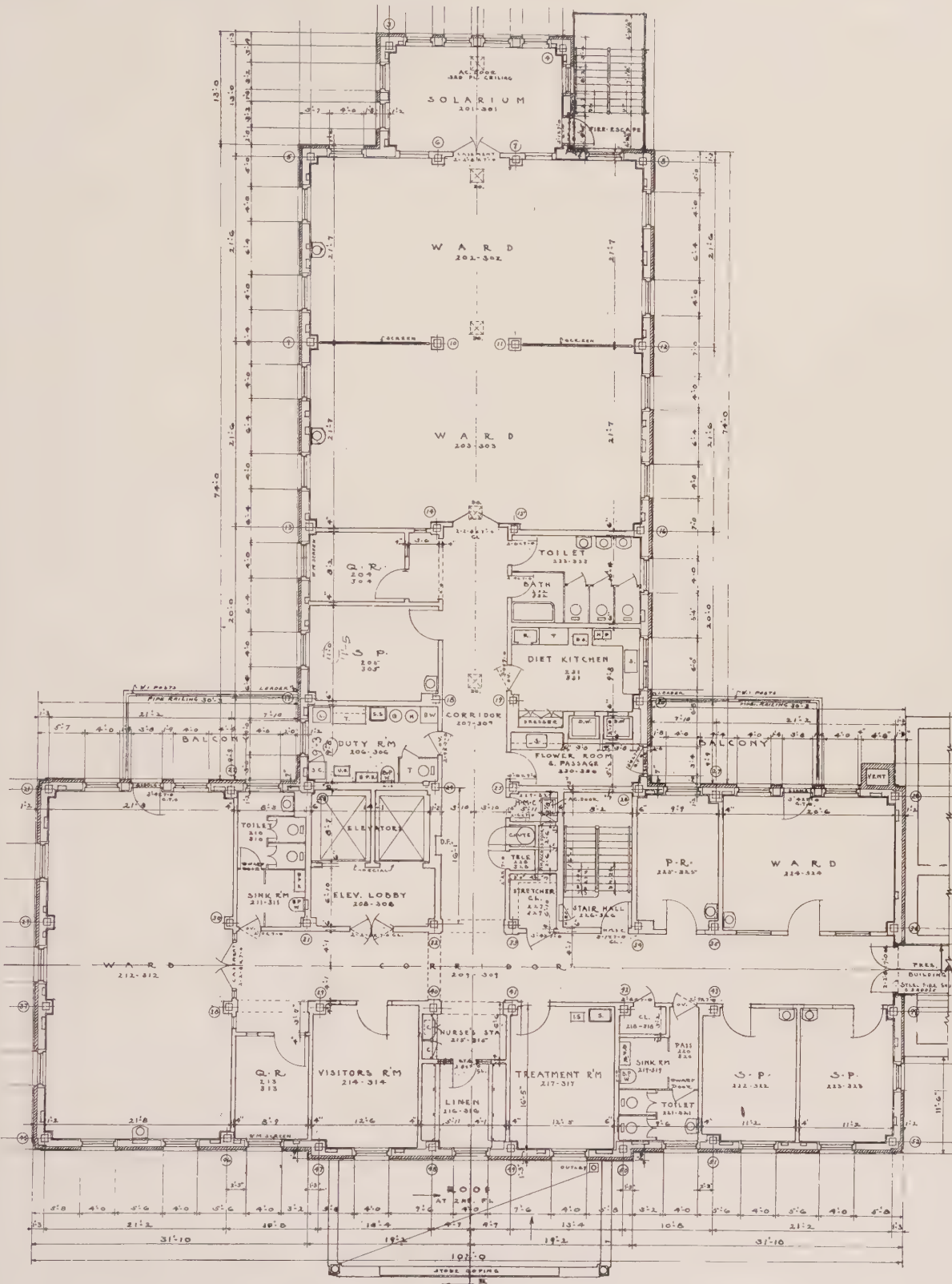
Adjoining each operating room or pair of operating rooms, there should be a sterilizing room in which the sterilized instruments and supplies needed in operating may be kept. There must also be a "wash-up," or "scrub-up," room for the doctors adjoining each operating room or pair of operating rooms. There should be a lobby or corridor in the operating department communicating with all rooms in the department and independent of any other traffic. Not infrequently two operating rooms are grouped together and share a common sterilizing room and "wash-up" room. Operating rooms grouped in this manner are spoken of as a "battery."

Outside of the operating lobby, so that the patient does not penetrate this lobby while conscious, should be the anesthetizing rooms—12 ft. x 16 ft. is a good size for an anesthetizing room. This room should be pleasant in appearance, the walls of warm coloring and it should suggest as little as possible the operating room to which it leads.

On the operating floor, convenient to the operating rooms, but so placed that it is accessible without entering the operating lobby, should be the nurses' workroom and general sterilizing room.

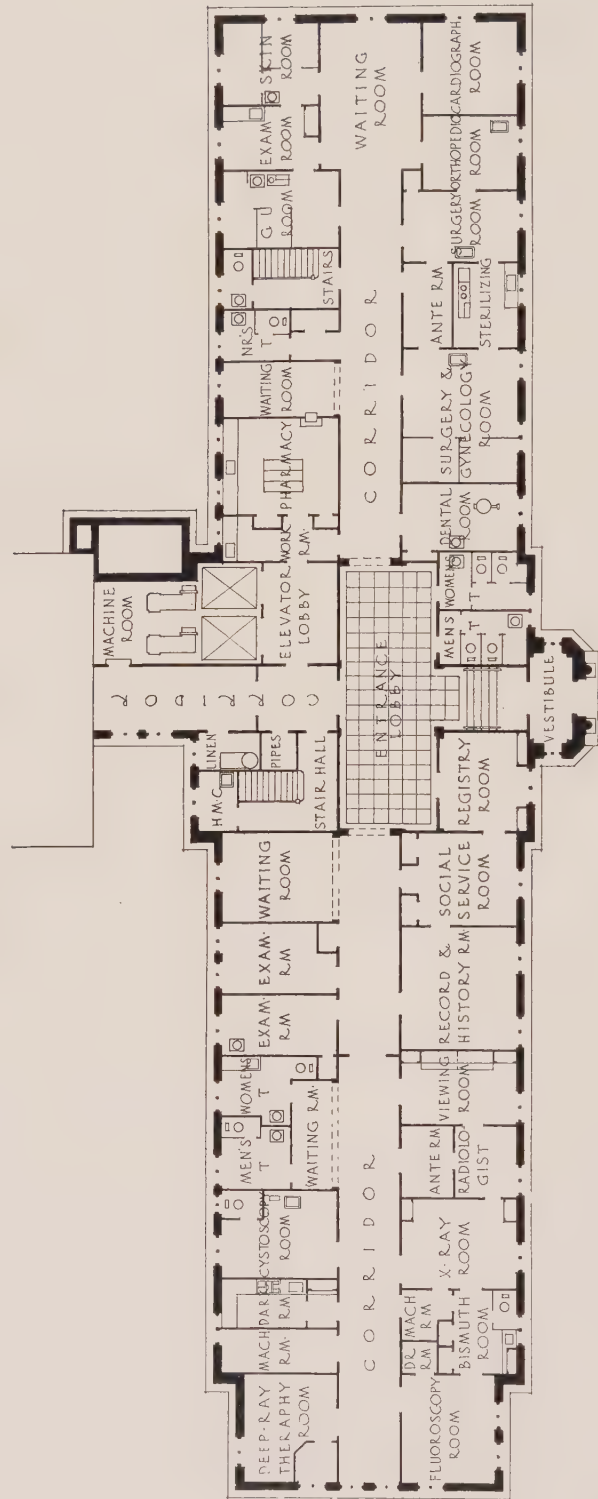
Probably everyone is more or less familiar with the procedure in operations, but for the sake of getting the requirements in mind let us state it, in a general way. The patient is taken from bed in a private room or ward on a wheeled stretcher, brought up in an elevator to the anesthetizing room, where the anesthetic is administered. When under the influence of the anesthetic the patient is wheeled through the operating lobby on a stretcher to the operating room and placed on the operating table. The nurses in their freshly laundered uniforms adjust the gauze over the mouth and nose of the surgeon and his assistant and help them into their operating gowns, and sterilized rubber gloves, the doctors having "scrubbed up" in preparation. The work goes forward, the nurses passing back and forth between the operating room and the sterilizing room. The used instruments and utensils are placed in trays and carried down the corridor to the nurses' workroom. From there the instruments are sent to the general sterilizing room to be sterilized and later returned to their places in the sterilizing room connected with the operating room. After the operation the patient is placed on a stretcher and taken back to the private room or ward.

OF MODERN BUILDINGS



Typical Ward Floor, The Bayonne Hospital, Bayonne, N. J.
Crow, Lewis & Wick, Architects

THE PRACTICAL REQUIREMENTS



Ground Floor Plan, Paterson General Hospital, Paterson, N. J.

Crow, Lewis & Wick, Architects

SCALE IN FEET
0 5 10 15 20

It is apparent that the arrangement of the operating room and its dependencies—the anesthetizing room, wash-up room, sterilizing room, and the operating lobby—must be such that nurses passing will not inconvenience doctors who are scrubbing up or that a stretcher passing through the operating lobby will not interfere unduly with nurses or doctors. There should also be a doctors' dressing room and locker room, and a doctors' toilet in the operating department, and it is also desirable to provide a small room and a toilet for the operating room nurses.

A maternity hospital, or maternity floor, requires delivery rooms and labor rooms, as chief among its special features. A practical layout for these facilities is shown on the plan of a floor of the Bayonne Hospital, by Crow, Lewis & Wick, on page 7. This section will be seen in the lower right-hand corner of the plan.

Here a lobby gives entrance to the delivery room and "birth room," also called "labor room," placed side by side. The delivery room is very much like a small operating room. The minimum size may be taken as 12 ft. x 16 ft. It contains an operating table. There must be a sterilizing room adjoining and there should be a utility room, with sink, nearby. The doctors' "scrub-up" sink may be in the delivery room.

The labor room, marked "birth room" on the plan on page 7, is a smaller room usually than the delivery room, but should be large enough to serve as a delivery room in case of necessity. This room is sometimes used for the preparation of patients, for in addition to the "waiting women" the hospital usually receives a considerable number who require immediate attention upon arrival.

It is sometimes necessary to remove the patient expeditiously from the delivery room to an operating room, so the delivery rooms should be conveniently located with reference to the operating room, but they should not adjoin or be closely connected, because of the fact that maternity cases are especially susceptible to infection. Since it is convenient to have the whole maternity department on the same floor, and the operating rooms are usually on the top floor, the delivery room and operating room are not usually on the same floor. As a general rule there should be one labor room and one delivery room to thirty beds in a maternity hospital or maternity department. Because of the noises which come from them, labor rooms and delivery rooms should not face parts of the hospital in which patients are housed.

Other special facilities required for the maternity division are a nursery, facilities for bathing babies and special bathing arrangements for the women. The nursery should have an exposure affording sunlight part of the day at least and good natural ventilation.

As in the case of labor rooms, nursery windows should not face the rooms of other patients. A

nursery about 12 ft. x 23 ft. is a good size for a maternity unit containing thirty beds for women patients and there should be 200 to 300 cubic ft. of space for each infant.

Adjoining the nursery must be a nursery service room, for bathing babies, and other work. Babies are usually bathed on a slab, with a spray, and it is important that the sprinkler be supplied through a positive temperature controlling valve. There should be two bathing slabs for babies to a unit of thirty women patients. This room should have sufficient radiation to maintain a temperature of 80° Fahrenheit.

Besides the bathing slabs, the nursery service room should contain a table with scales for weighing the babies, a tub for washing napkins and cupboards for needed supplies and equipment.

To confine noise, the nursery should be cut off from the corridor by a vestibule or lobby and the department should be soundproofed.

In a maternity department of thirty beds there should be one shower bath, with stool, where women patients may be bathed with a spray by a nurse. Shower bathing is usually preferred to tub bathing, but it is desirable to have one bathtub to a floor. The bathing of patients on a slab with a spray is favored by some and is, perhaps, best. As the bathing of the women patients is done almost entirely in bed by the nurses the requirements for bathing facilities are relatively small.

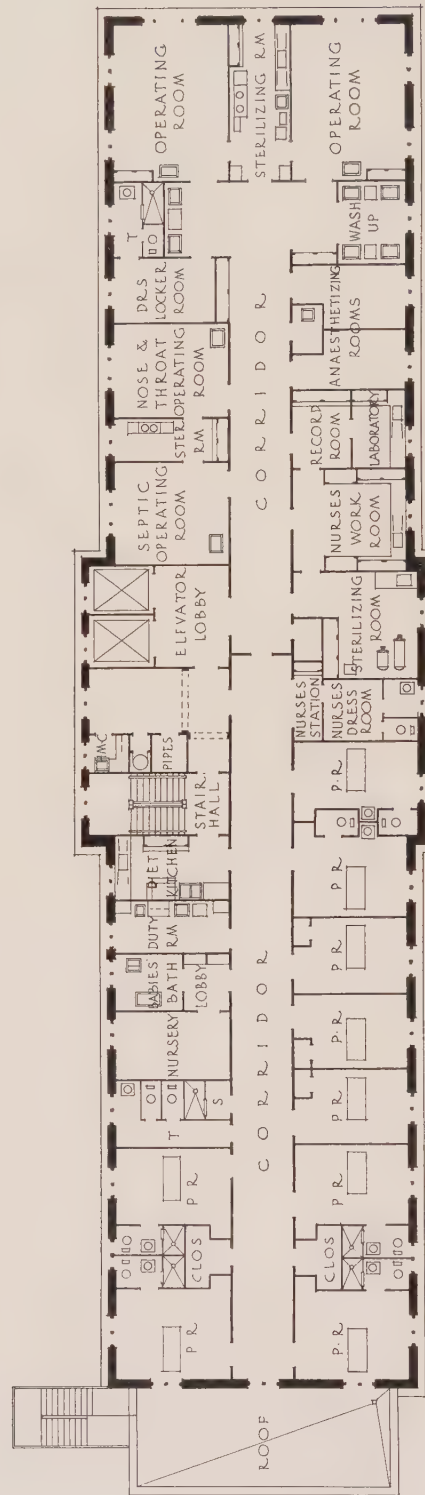
In addition to the diet kitchen of the maternity department, for the feeding of adult patients, this department should have facilities, in a separate room, for the preparation of formula diets for the babies and a refrigerator for storing this food, and there should be also a sterilizer for the nursing bottles.

Besides the general nursery, there should be a small observation nursery, in which babies suspected of having a communicable disease can be isolated.

The wards in present day hospitals are small compared with those of former days, from eight to twelve beds being usual. There is a tendency to increase the number of four-bed wards and semi-private rooms. In order to provide a general idea of sizes, it may be said that a ward 22 ft. x 42 ft. will accommodate eight beds while a semi-private room 16 ft. x 16 ft. will take two beds. A private room can be about 10 ft. x 16 ft. and 14 ft. x 16 ft. or 12 ft. x 18 ft. are very liberal sizes.

The sizes of wards, semi-private and private rooms are governed more or less by the required number of cubic feet of space per patient. A good minimum standard is 1000 cubic feet per patient. 1200 cubic feet per patient is sometimes wanted. Though the ceiling height is governed to some extent by the required cubic area in relation to the floor area, 10 ft. 6 in. may be considered a good height for wards and semi-private rooms.

THE PRACTICAL REQUIREMENTS



Floor Plan, Paterson General Hospital, Paterson, N. J.

Crow, Lewis & Wick, Architects

Where there are private rooms exclusively on a floor the height may be 10 ft. or 9 ft. 6 in.

Rooms may contain the required number of cubic feet and still be very badly proportioned, too long and narrow or too small in floor area and with too high a ceiling. There must be good working space around the bed, room for a bedside table, for a bureau and an easy chair and side chair in a private room, and the shape of the room should be such that it can be furnished conveniently and pleasingly. Many of the older hospitals have very ugly rooms that are depressing to the spirits of the patients.

A good size, in general, for the windows of wards and private rooms is 4 ft. wide, extending from about 2 ft. 6 in. above the floor to within about 4 in. of the ceiling. The ceiling height of corridors may be taken as 10 ft.

Convenient sizes for rooms are as follows: private 10 ft. x 16 ft. to 12 ft. x 16 ft., semi-private (two beds) 12 ft. or 14 ft. x 16 ft. A good ceiling height for private rooms is 9 ft. 6 in. to 10 ft. 6 in., and in wards 10 ft. 6 in. to 12 ft. Corridors may well be from 8 ft. to 10 ft. wide.

Wards, in addition to having the required cubic area, should be of pleasing proportions and so planned that the windows and wall areas permit a good arrangement of beds. A good spacing of beds in wards is 8 ft. on centers.

The arrangement should be such that the light does not shine in the patients' eyes. One of the accepted ways is to place the beds with their heads against the walls between the windows, but when the beds are placed so that their sides are towards the windows, at some distance, the result is, perhaps, better, while the light is not in the eyes of the patients they can see out of the nearby windows and this is a more cheerful outlook.

There should be a small ward in which patients developing communicable diseases may be isolated.

There should be a "quiet room" in conjunction with the ward, to which a patient may be removed whose condition is such that he would either be disturbed by other patients in the ward or would disturb others. The quiet room should be near the nurses' station. Such a room can be seen next to the nurses' station in the plan of a floor of the Bayonne Hospital on page 9.

It is well to provide also a number of semi-private rooms in order that patients suffering from the same ailment and requiring the same treatment may be kept together.

Whether or not to have men's and women's wards on the same floor is a debated question. It is desirable to have all the surgical cases together and all the medical cases together, but where both men and women ward patients are on the same floor the arrangements are complicated. Patients of one sex must be able to reach a solarium without passing through a ward occupied by patients

of the opposite sex, also, when there are both sexes on a floor, toilet rooms and bathrooms for each sex must be provided, which complicates the planning.

There should be a solarium, with a sunny exposure, opening off of each floor and if possible some balconies should be provided large enough to accommodate the beds of patients requiring outdoor treatment.

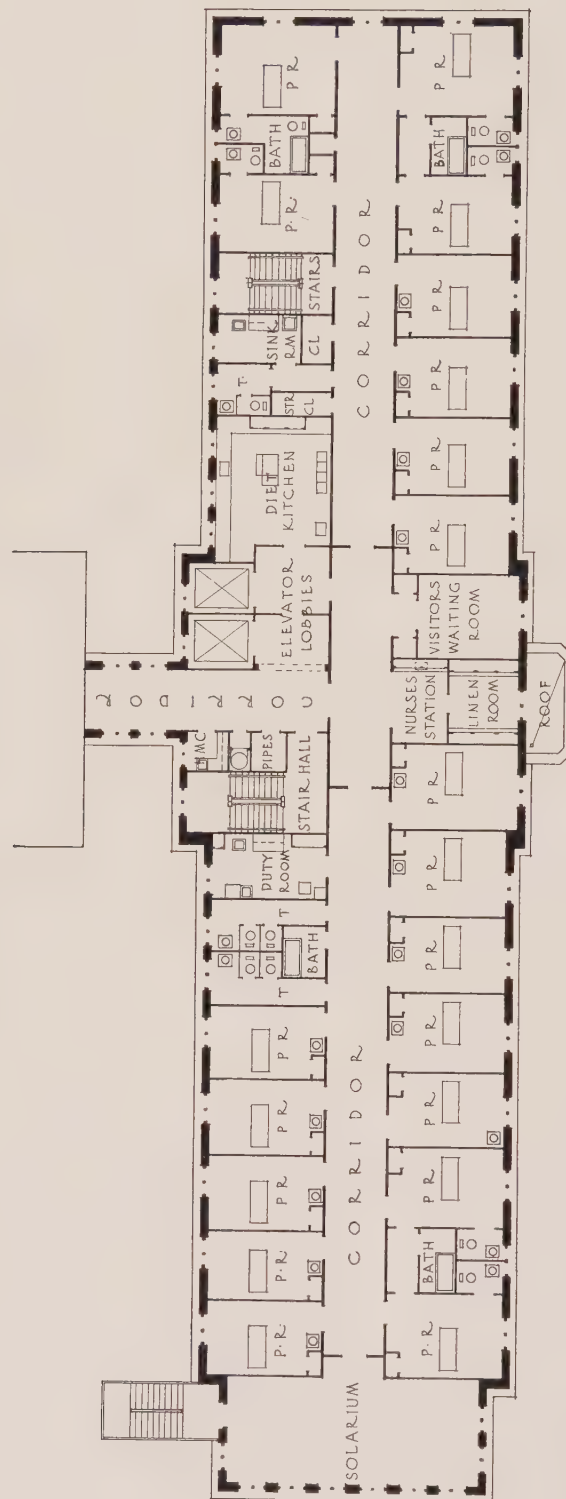
There must be toilets and sink rooms so placed that they are close to the different sections of the wards. Convenient handling of the bed pans is important in a hospital and the sink room should be readily accessible. Two sink rooms to a floor of thirty beds is practical, in addition to the utility room.

Often a toilet room and a sink room are combined. Such an arrangement is shown in the plan of a typical floor of the Bayonne Hospital on page 9. The sink room equipment is screened by marble partitions and there are similar partitions between the water closets and the wash bowl. These partitions do not extend to the floor or ceiling. The sink room is for bed pan service exclusively. Its equipment consists of the following: a bed pan washer, a bed pan sterilizer, and a bed pan rack, or a warmed cabinet for storing the cleaned bed pans.

Equipment for bed pan service is included also in the room or combination of rooms variously known as the "nurses' workroom," "duty room," or "utility room." There must be at least one of these rooms to a floor. One may be regarded as sufficient for thirty beds, with two sink rooms.

The typical nurses' workroom, duty room, or utility room contains the following equipment: a bed pan washer, bed pan sterilizer, bed pan rack or cabinet, utensil sterilizer, instrument sterilizer, blanket warmer, and solution warmer, specimen closet, soiled clothes hopper, waste can, clinic sink, deep hopper sink and a table with shelves above.

Sometimes this equipment is placed in a nurses' workroom and the utility room that are separate, but adjoining, rooms. This is the case in the new Presbyterian Hospital of the Columbia-Presbyterian Medical Center in New York City. On a typical floor of the private patients' pavilion we find a nurses' workroom containing the following equipment: utility sink, solution cabinet, scrub-up sink, refrigerator for cracked ice, utensil sterilizer, instrument sterilizer, table with two-burner gas plate, shelves under. Opening from the nurses' workroom is a heated drying closet and a ventilated drying closet, also an ordinary closet. Opening upon the corridor is the blanket warmer in a closet. In the adjoining utility room are the following: bed pan washer, bed pan sterilizer, bed pan warmer, specimen refrigerator, deep hopper sink, table with marble shelf over. This room has a drained floor. Fitted into this section, but opening upon the corridor, is the cleaners' closet



Typical Private Room Floor Plan, Paterson General Hospital, Paterson, N. J.
Crow, Lewis & Wick, Architects

Crow, Lewis & Wick, Architects

with slop sink and space for buckets and cleaning utensils.

There are, of course, innumerable details of a hospital that it is not possible to describe or even mention within the limits of a single chapter. There are the chutes for soiled linen that run from the various floors to the basement, the laundry, kitchens, the heating equipment and the internal system of signals. To even the smaller details, thought has been given by hospital authorities and manufacturers of equipment; for instance there is a type of call bell that has a soft mellow sound that does not disturb the patients but that can be heard clearly, and there is also the silent signal light system by which a patient can send a signal which will attract the attention of the nurse on duty.

The stairs in a hospital must be at least 3 ft. 8 in. wide in the clear and have large landings to afford passage for a hand stretcher.

A better width is 4 ft. and 6 ft. x 8 ft. is a good size for landings. If the landing is less than 6 ft. wide a stretcher can not be taken around the turn. There must be no steps in the landing. It must not be necessary to lift a stretcher over a newel post or rail in making a turn. It should be possible to take a bed down the stairs. The stairs in a hospital should not be of the open string type, but enclosed between walls to prevent accidents that might occur were there a balustrade and well.

The artificial lighting should consist of bracket lights or indirect ceiling fixtures in the rooms, of indirect lighting fixtures entirely in the wards, and in the corridors the choice of fixtures is optional, wall lights often being used which are recessed in the wall near the floor.

No mechanical means of ventilation is ordinarily provided in a hospital. It usually is not needed and the opening of windows would disturb its operation. There must be an effective heating system.

Telephone extensions in some or all of the rooms, connected through the switchboard with the regular outside telephone system, usually make a private internal system of telephones unnecessary.

In the X-ray department special protection is provided against exposure to the X-rays by lead-covered walls, shields, etc., of lead. Lead is the standard protective medium against X-ray. Ray-proof rubber is good and of better appearance than lead. Plastic material of a special nature is also used as a protection.

The walls of private rooms, wards, and all other rooms excepting operating rooms should be painted. The operating room should have a tiled dado and painted upper walls and ceiling.

The materials for floors in a hospital may well be chosen as follows: operating room, flint tiles; nurses' workroom, vitrified tiles; sink room, vitrified tiles; entrance lobby, marble or terrazzo; corridors, linoleum or rubber; wards, terrazzo with

linoleum or rubber runners; private rooms, linoleum with terrazzo or cement base.

The basement of a hospital generally is devoted to service, but the accommodations vary. Some if not all of the following are to be found in the hospital basement: kitchen, kitchen store rooms and refrigerators, special diet kitchen, dining room for help, sometimes nurses' dining room, laundry, boiler plant, lockers for help, morgue, general storage, drug storage, linen storage, sometimes paint shop, carpenter shop, splint room. Sometimes there is an emergency or accident operating room in the basement, so that a patient brought in an ambulance can be taken care of with the greatest expedition, on occasion. Sometimes there is a patients' receiving room in the basement. It depends largely upon how far the basement projects out of the ground and upon the special requirements of the particular hospital. It may be said, in passing, that the kitchens are not so frequently placed at the top of the building as they were at one time.

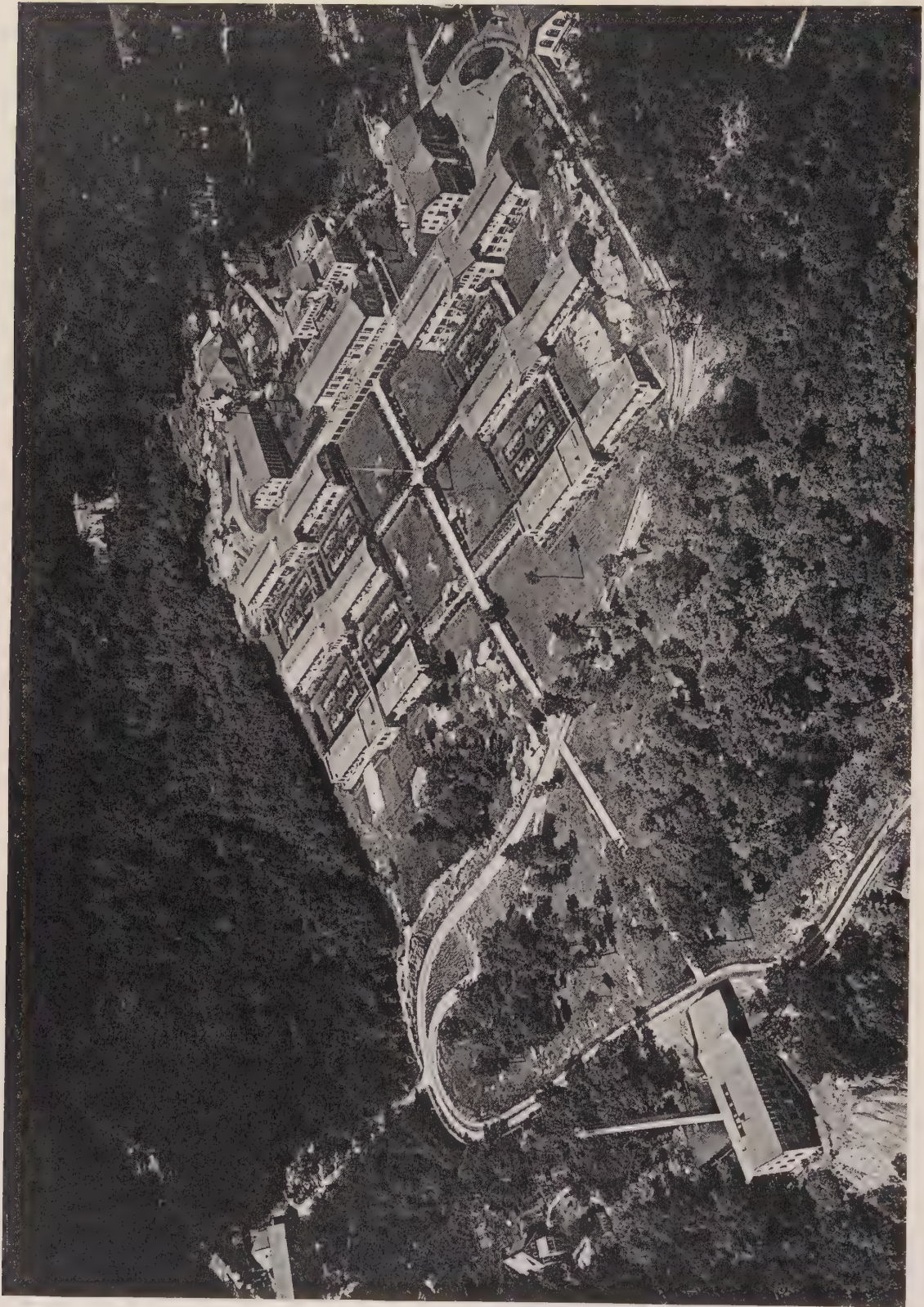
A nurses' home is frequently provided in connection with a hospital. It should be a separate building and it should be designed with due regard for its own special requirements which are highly important. A chapter devoted to the nurses' home follows this one.

The orientation, shape and size of the site largely control the choice of a plan. All wards and patients' rooms in a hospital should receive as much sunlight as possible, therefore they are, so far as can be, made to face the south and rooms that do not require sunlight, such as visitors' rooms, treatment rooms and operating rooms can be given northerly exposure.

Whatever shape of plan may be considered it should be one that permits the making of additions later that can be served by the facilities and means of communication of the original building. Hospitals always have to be enlarged within a few years after they are built in order to keep pace with the demand for their service. A good example of a plan that answers this requirement is the T-shaped plan, for additions can be made at the ends of the cross-piece and to the end of the stem without disturbing the central features.

A site that slopes towards the south, with the ground lower at the rear of the hospital than at the front, is ideal. It brings the administrative offices, visitors' room, entrance lobby, etc., which are naturally along the front, at the north, and the wards and rooms facing the south. The slope of the ground brings the basement out of the ground at the rear and makes it available for kitchen and other service requirements.

In design treatment there is a strong tendency towards simplicity, character being given to the design by well studied proportions rather than by elaboration or purely decorative architectural features. The expenditure of money upon elab-



Airplane Photograph of Tuberculosis Sanatorium at Mt. McGregor, N. Y., for Employees of The Metropolitan Life Insurance Co.
D. Everett Waid, Architect, New York City

orate detail is not warranted in the case of a hospital, for the money available should be expended in the use of good materials of finish and in good equipment. A hospital should be of dignified and pleasing appearance. There is a tendency to get away from the familiar hospital look and to give hospitals, especially those in the city, much of the appearance of apartment houses. This same thought is expressed in the interior treatment, which is made friendly and inviting. A good example is the lobby of the Englewood Hospital, Englewood, N. J., Crow, Lewis & Wick, architects, which is shown in the photographic view on page 1.

It is believed that such a general picture of hospital requirements as the one that has been presented above is valuable because, much of the detail having been omitted, the main facts stand out prominently. There is always danger of becoming lost in detail. For this reason it is hoped that this outline may be found a helpful guide to those who may pursue this subject further by the reading of the thorough works devoted exclusively to hospital problems.

Very valuable reference material on this subject is to be found in the back issues, as well as in the current issues, of "The Modern Hospital," which is published monthly in Chicago.

A tuberculosis sanatorium is of so special a nature that there is more need for the advice of a consultant or of the assistance of others whose experience has acquainted them with the requirements of this type of building than in the handling of most problems. Fortunately the American Tuberculosis Association maintains an advisory service for sanatorium and other tuberculosis institutional construction. The Association does not supply plans, but gladly advises architects who submit their preliminary plans for this kind of construction for comment and suggestions. There is no charge for such service excepting that in cases involving travel on the part of a member of the staff, the Association expects to be reimbursed for his travelling and living expenses during the time he is away from New York. The Association maintains files of blue prints and of other helpful material at its headquarters in New York, where this material is available to architects who wish to refer to it.

In the first place it is well to get a picture of what happens. Patients who need to be confined to an infirmary are cared for in a hospital that differs but little from any general hospital, with the exception of certain special features; semi-ambulant patients spend the greater part of the day resting in chairs on porches, then go to the dining room for meals and sit in the day room; ambulant patients take more or less exercise, walk, play croquet and engage in light handicrafts. It is apparent that a tuberculosis sanatorium is a three-part institution with the patients progress-

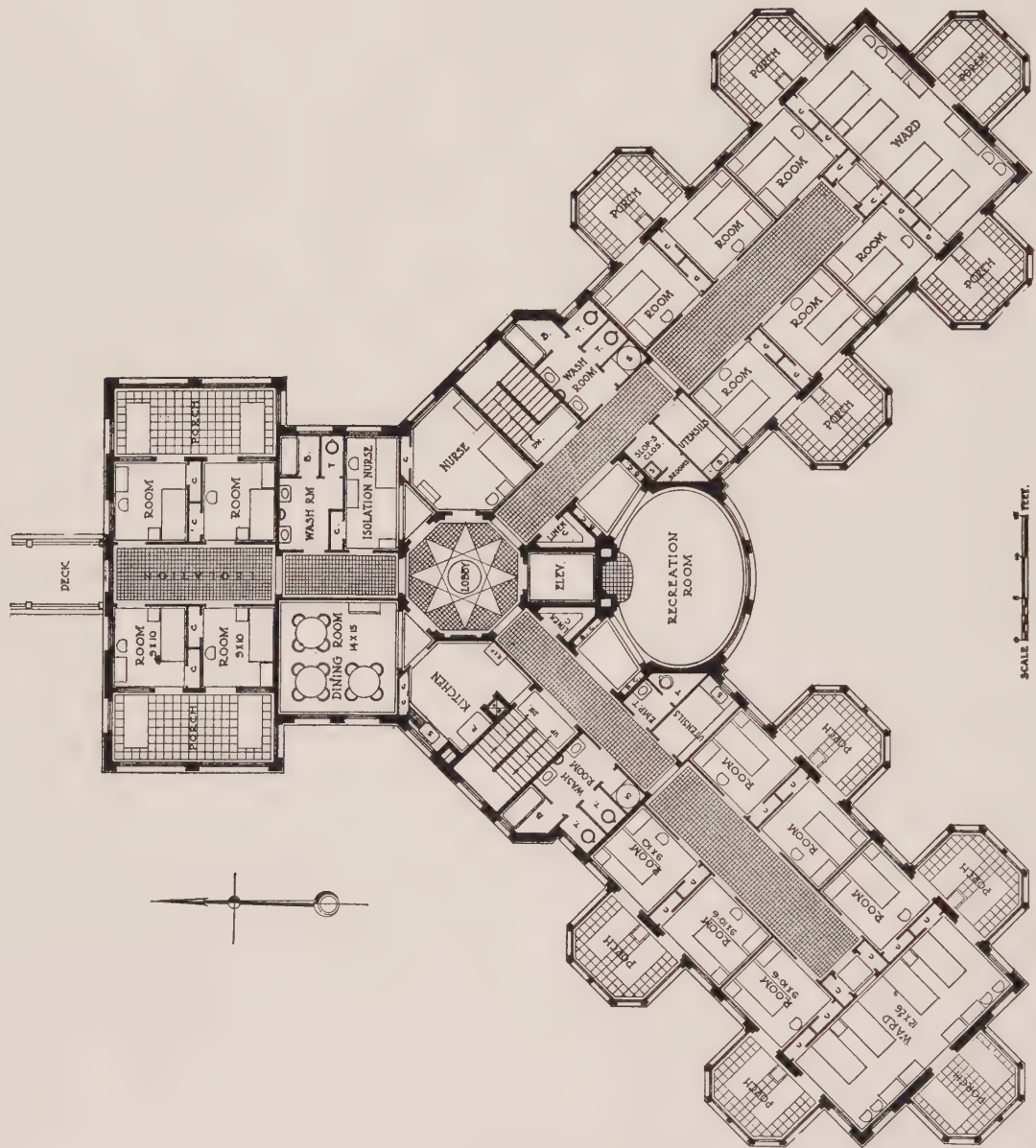
ing from part to part as the cure progresses. According to a widely used estimate by the United States Public Health Service the percentage of patients of each class in a sanatorium may be assumed to be as follows: infirmary patients 40 per cent.; semi-ambulant patients 25 per cent.; ambulant patients 35 per cent.

In the infirmary provision must be made for sleeping out of doors. There must be a small dining room for those few patients whose condition permits them to break the monotony of bed-feeding by going to the dining room. A laboratory is needed for sputum analysis and other tests. An X-ray room or department is required, varying from a single room with a combination machine for fluoroscopic work and the taking of radiographs to a complete X-ray department. There must, of course, be a dark room for this work and a plate storage room. At least one treatment room for the eye, ear, nose and throat is needed. There must also be a room equipped with dental chairs, etc. Where the services of a visiting dentist are employed no laboratory for mechanical work is needed. There should be a room in which simple surgical operations can be performed, but patients needing to undergo major operations are usually removed to the nearest general hospital. There must be ample space for the storing of case records as they are preserved for years and used in keeping in touch with ex-patients.

The quarters for semi-ambulant patients consist, usually, of open wards adjoining a service section containing nurses' room, linen room, separate toilet room, and bath room, also sitting room or day room and a diet room. It seems preferable to provide wardrobes in a heated corridor along the back of the wards rather than lockers in a congregate dressing room. It is considered desirable to divide the wards into sections containing one bed, two beds or four beds, even if the division is only into cubicles. Windows, often hinged from the top, with screens inside, have largely taken the place of the old-time canvas curtains as a means of closing the front of the ward when a storm renders this necessary. There should be a warm room in which a patient suffering a hemorrhage or other form of relapse may be made comfortable.

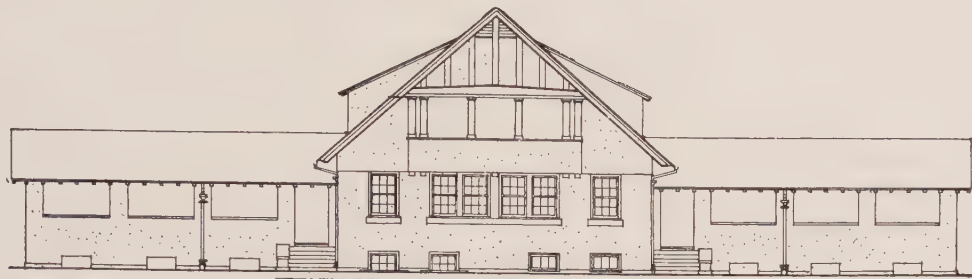
For the ambulant patients there must be a dining room or dining rooms; sometimes the cafeteria plan of operation is employed. These patients need diversion, therefore there should be an assembly hall with motion picture projection booth and a platform. Facilities for engaging in light handicrafts are needed and space in which the occupation therapist may store his materials, etc. Quite often the patients who are confined to their beds as well as the ambulant patients engage in light hand work. Hydrotherapy is now employed and the requirements of the particular institution in this respect should be ascertained.

THE PRACTICAL REQUIREMENTS

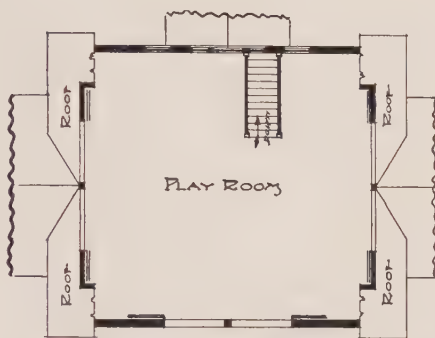


Nassau County Sanatorium, Long Island, N. Y.
Steward Wagner, Architect

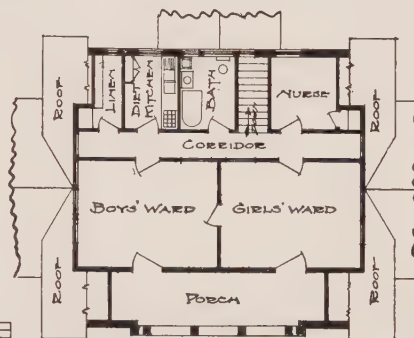
OF MODERN BUILDINGS



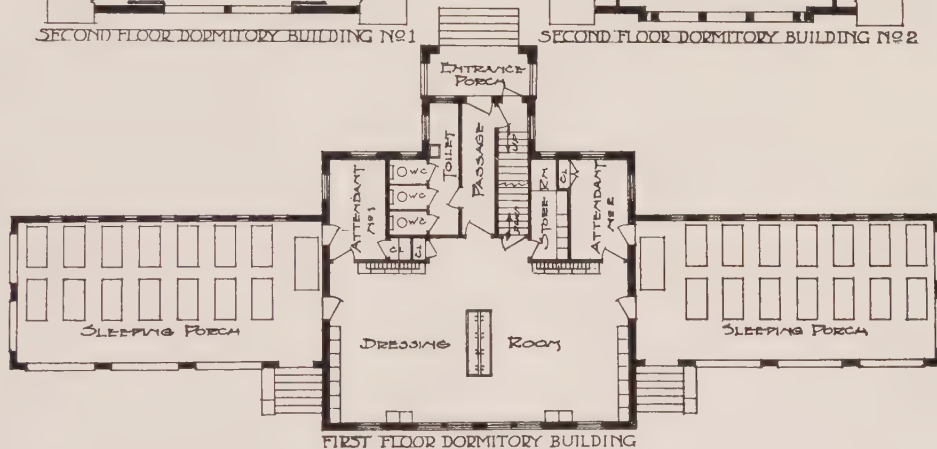
SOUTH ELEVATION DORMITORY BUILDING NO. 1



SECOND FLOOR DORMITORY BUILDING NO. 1

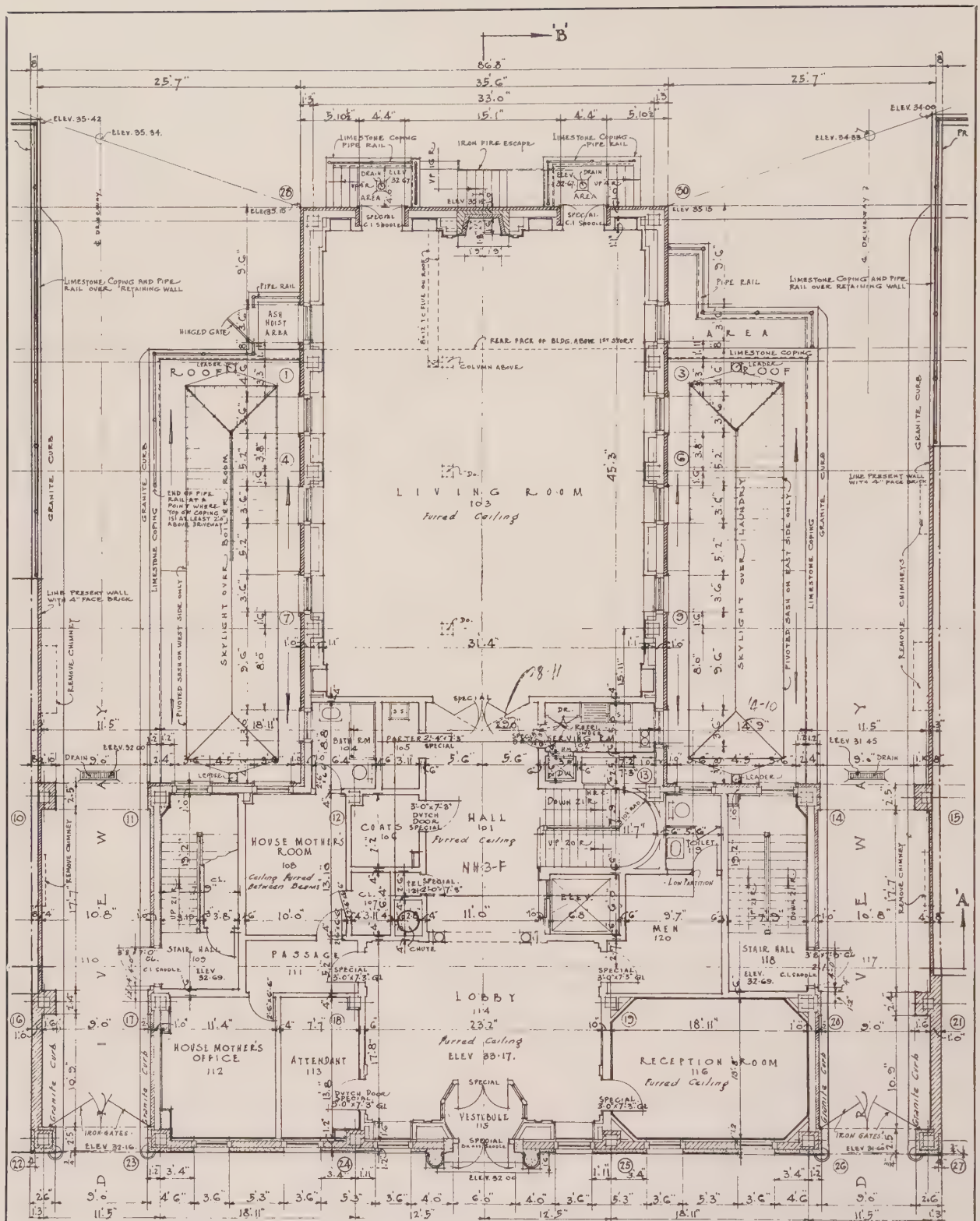


SECOND FLOOR DORMITORY BUILDING NO. 2



FIRST FLOOR DORMITORY BUILDING

Typical Preventorium, Courtesy of The National Tuberculosis Association



Plan of First Floor, Nurses' Home and Help's Building for The French Hospital, New York City
Crow, Lewis & Wick, Architects

CHAPTER II

NURSES' HOMES

THE purpose of a nurses' home is threefold; to provide living quarters for the nurses connected with the hospital to which the home belongs; to provide reception and entertainment rooms for their use; and to afford the necessary facilities for the training of nurses.

The nurses' home should be separate from the hospital. Some maintain that it is better to locate it farther away than on adjoining property, as the nurses then get more completely away from the hospital atmosphere in which they spend their working days. Frequently, however, the nurses' home is on a part of the same plot of ground as the hospital, and sometimes it is connected with the hospital by an enclosed passage or bridge.

In any case, it should have as little of the institutional character as possible and should be as homelike as it can be made. It is a kind of combination living club and school.

Nurses' homes vary in size and elaboration all the way from the simple house built to accommodate the few nurses attached to a small suburban hospital to the big thoroughly equipped homes for hundreds of nurses attached to the great hospitals.

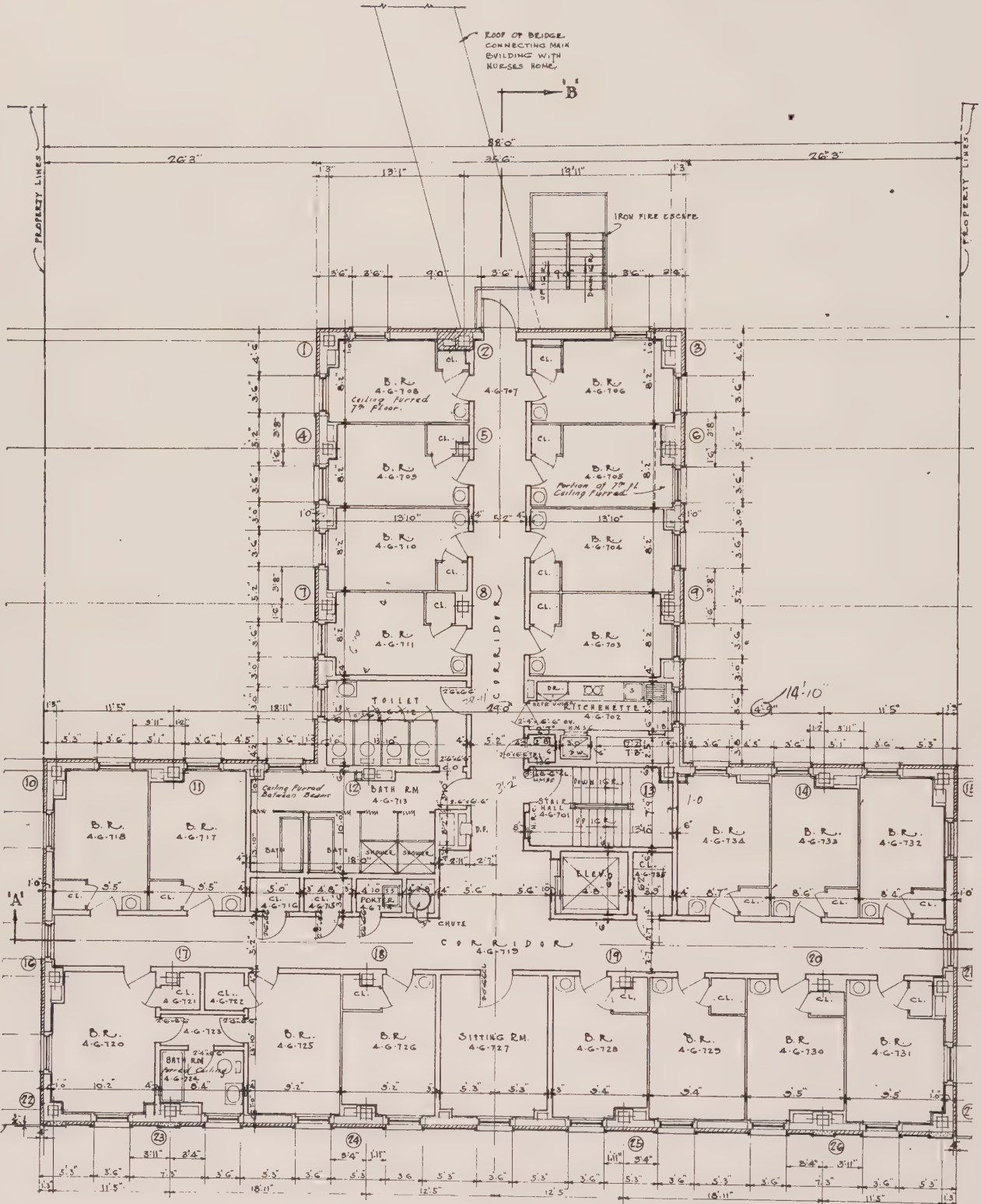
A clear idea of the practical requirements of a nurses' home may be gained readily through a study of the plans for the nurses' home for the French Hospital, New York City, Crow, Lewis & Wick, architects, plans of which are reproduced herewith. The requirements vary somewhat with individual cases but the essentials are the same.

The living quarters are shown on the typical floor plan of the fourth, sixth and seventh floors of this building reproduced on page 22. In addition to a room for each nurse, there is a sitting room on each floor for the use of those living on that floor. There is also a kitchenette. In this case, each nurse is provided with a wash bowl in her room, but the bathing and toilet facilities are common to the nurses on the floor. It is very seldom that a bathroom is provided with each nurse's room. The bathroom and toilet room are centrally located and it will be noted that the baths and the water closets are in separate, though adjoining rooms. Two bathtubs and two shower baths are provided for nineteen nurses. A good rule is one bath to five nurses. There should be one water closet to five nurses.



Nurses' Home, Home for Incurables, New York City
Crow, Lewis & Wick, Architects

THE PRACTICAL REQUIREMENTS



Typical Bedroom Floor Plan, Nurses' Home and Help's Building for The French Hospital, New York City
Crow, Lewis & Wick, Architects

The room in the lower right-hand corner of the plan of this floor, and the ones like it, may be regarded as especially well planned. The closet is along the wall that is next to the corridor, leaving the end of the room along the outside wall free; the wash basin is also placed out of the way. The window is at one side, leaving a place for the bed between the closet wall and the wall at the side of the window. This makes it possible to place the head of the bed against a wall in either direction. This room is designed to furnish well, an important point. Each nurse's room should accommodate a bed, large easy chair, dresser, small side chair, and floor lamp with additional room for a small writing table and a small bench or desk chair in front of it, as these may be desired.

A good size for a nurse's room is about that shown here—9 ft. 4 in. x 13 ft. 10 in. A good size for a reception room on a bedroom floor is 10 ft. x 14 ft. or 12 ft. x 14 ft.

In the lower left-hand corner of this plan is seen a room that is somewhat wider than the nurses' bedrooms and that has a private bathroom with water closet. This is a room for a technician, a woman who has taken special training and is engaged in technical work in connection with the X-ray department, laboratory or some other special department of the hospital. In this particular nurses' home there is a room for one technician on each of the floors devoted to nurses' bedrooms.

The reception and entertainment facilities center upon the ground floor, naturally. Referring to the ground floor plan on page 20, we find an entrance lobby with room for the attendant who exercises supervision, takes charge of mail, interviews callers, has the record at hand showing whether a nurse is in or out, etc.

Opening from the lobby is also a reception room for the convenience of nurses in receiving callers. The coat room is placed near the elevator so that a nurse coming in can conveniently check rubbers, coat or other property. Off the lobby is a passage that forms the private corridor of the house mother's quarters, her room and bath being on one side and her office on the other, at the front of the building. The house mother is the authority in charge of the home. We see also on this plan the large living room, which is the most important part of the reception and entertainment section. It should be planned with the thought that it is to be decorated and furnished in a home-like manner, with tables and big comfortable chairs, lamps, etc., very much like the main room of a present-day club. A fireplace is, of course, needed in such a room.

A teaching division is shown on the plan of the fifth floor of this building, see page 24. In the demonstration room, which is arranged like a ward in a hospital, the student nurses are taught the methods of caring for patients. They are shown

how to make beds, how to turn and move a patient about in bed, and all the other necessary methods. Sometimes they use a mannequin, but sometimes a nurse acts the part of a patient, therefore a dressing room is needed in connection with the demonstration room.

A diet kitchen is needed in order that the student nurses may be instructed in the proper preparation and service of the food for patients. There are electric ranges grouped together in the middle of the floor, so that a class may work at them under an instructor, and other necessary equipment: blackboard, dressers and one or two sinks, etc.

In the lower right-hand corner of this floor plan is a large room marked "classroom." It is used for lectures to classes by instructors. The chairs shown here have one wide arm each to rest a notebook upon. It is to be noted that a platform should be provided for the instructor's desk, and a blackboard.

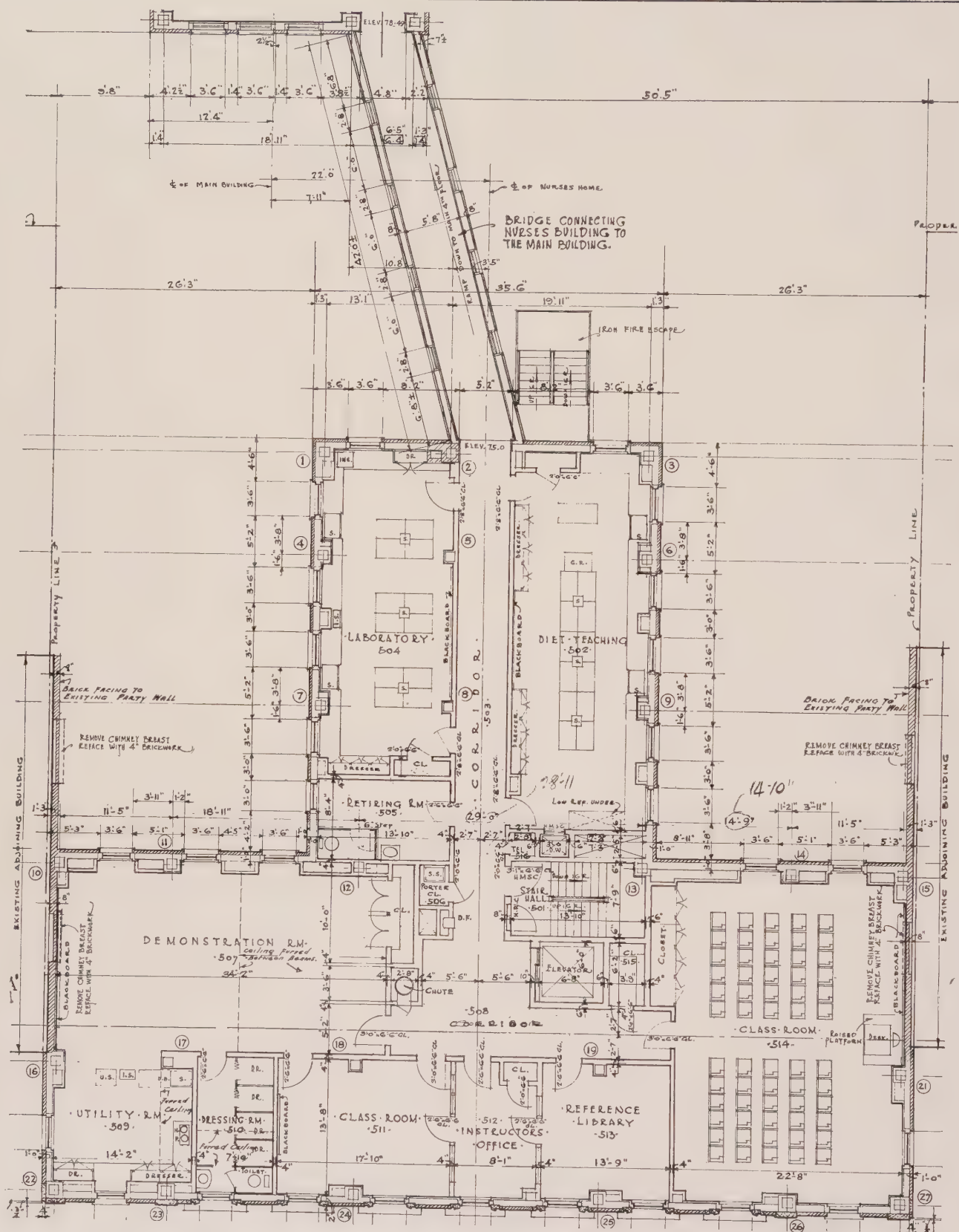
A laboratory with grouped tables is needed, for the nurses are given laboratory work in the course of their training.

A completely fitted hospital utility room (duty room or nurses' workroom) is needed in which the students may be trained in the performance of the part of hospital work that centers in this room, sterilizing, cleaning utensils, etc.

Certain of the features of the first floor plan of the building we have just been considering, have their origin in the fact that while the ground floor and the upper floors are to be used as a nurses' home, the lower sleeping room floors are to be used in housing the hospital help. The help will enter through the gates at the right and left of the front of the building, the men and women using separate entrances. They will then use the stairs at the sides of the building to reach their quarters, which are only a few flights up, at the most. The stairway used by the help of one sex will have no doors at the floors occupied by the help of the opposite sex, and neither the help's floors nor their stairways connect or give access to the nurses' quarters at any point. Whenever a separate help's building may be erected, the floors now occupied by the help can be made available for housing nurses.

The nurses' home and help's building for the French Hospital has been chosen for discussion here because it meets all of the essential requirements extremely well, and at the same time is not too elaborate to serve as a widely useful model. Some features that are not included in this building are desirable, and may well be provided in a nurses' home when the necessary money is available—for instance, a gymnasium and a swimming pool. Both of these provide pleasure for the nurses and help them to keep fit. Sometimes a nurses' home has a dining room and kitchen of its own, but usually the nurses' dining room is in

THE PRACTICAL REQUIREMENTS



Plan of Fifth Floor, Nurses' Home and Help's Building for The French Hospital, New York City
Crow, Lewis & Wick, Architects

the hospital where it can be served from the hospital kitchen, as the expense of maintaining a separate dining room and kitchen in the nurses' home, with the necessary staff, is very considerable.

Not only the interior but the exterior of a nurses' home should be homelike in appearance; it should not look like a part of a hospital but should look as much as possible like either a large country house or an apartment house, according to its location. A building of this kind, in the design of which there is little of institutional character, is the nurses' home of the Home for Incurables, Crow, Lewis & Wick, architects, a photographic view of which is shown at the beginning of this chapter.

Since, as has been pointed out in an earlier paragraph of this chapter, it is considered desirable by many to locate the nurses' home at some distance from the hospital, it is often possible to place it in a neighborhood of entirely different character from that surrounding the hospital. In our larger cities a few blocks across town in one direction or another make a great difference in the character of the surroundings. One of the practical requirements,

since it has a bearing upon the nurses' efficiency, is that the nurses' home provide as pleasant surroundings as possible. This placing at some distance from the hospital removes any possible reason for retaining even a trace of similarity of architectural treatment and a sense of fitness suggests that the nurses' home be given as much as possible of the design character of its neighborhood, perhaps the character of the apartment houses or private homes that surround its site. Where this is possible, it is, of course, desirable to have pleasant grounds about the nurses' home. Though this is impracticable in the city it is easily enough accomplished in suburban locations and in the smaller cities without placing the nurses' home at so great a distance from the hospital as to require too long a walk. These and many other considerations peculiar to each special problem are likely to come up in the architect's conferences with the hospital authorities for whom he may be planning a building and the more firm a grasp he has of such requirements as can be anticipated, the better able he will be to co-operate effectively with the members of the hospital board and staff.



Elementary School, Bergenfield, N. J.



Central High School, Trenton, N. J.



Junior and Senior High School, Princeton, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate

CHAPTER III

SCHOOL BUILDINGS

THE architect and the school board should know definitely what is to be taught and how it is to be taught in the case of any large school building before the work of planning is begun. This is obvious and it would seem unnecessary to state it were it not for the fact that many school buildings are planned and actually constructed by architects and school boards who have only hazy ideas on these essential points. Very often the school board is largely or entirely at fault in this matter, refusing to come to a definite decision and preferring to go ahead, build a school and use it somehow after it is built. The idea that schools can be standardized is largely responsible for this condition, probably. But, a standardized high school or junior high school never really fits anywhere. It is not possible to standardize even so relatively simple a school as a small elementary school, and get the best results. An educational survey to determine the needs of the community is a necessary preliminary to schoolhouse building in every case.

Our educational methods are in a state of flux; they are being recast to meet new conditions and new requirements. The extension of departmentalization is one of the outstanding tendencies. High schools are necessarily departmentalized; the teacher of chemistry, cooking, or of physics, or biology, or manual training cannot, for instance, come to the class with the necessary apparatus, so the class must go to the instructor and be taught in a special classroom or laboratory. This means that the pupils spend a large part of the school day in one or another of the numerous special classrooms instead of occupying classrooms of their own. In many cases the classes are practically homeless, and may be said to "live" in their lockers, if a local habitation can be assigned to them at all.

The departmentalization has extended through the creation of the junior high school and the platoon system. Among the results of this departmentalization we find the necessity for providing lockers, usually in the corridors, and



The Thaddeus Stevens Junior High School, Williamsport, Pa.
Guilbert & Betelle, Architects

we find constantly moving groups of students; incidentally, we find it desirable to keep the height of school buildings down, in order that the pupils, going from one special classroom to another special classroom, may not be obliged to climb stairs any more than can be prevented. Two stories may be regarded as ideal for a modern school building, while three stories is a good height. In some of the large cities schools are, of necessity, built much taller than this, but these are special cases met by school boards and architects who are familiar with the problems involved and who have worked out the best solutions they can find. There is no necessity for school buildings more than two or three stories in height excepting in the few very large centers of population, where the value of land is very high. The problem of the tall school building need not be considered here since it is not of general interest; we may let those struggle with it who have to do so. The examples here shown are representative of types of school buildings generally suited to the requirements of cities and rural communities throughout the country.

While further departmentalization has in many cases caused modification of the old 8-4 system of instruction, by which the twelve-year school



Main Entrance, Junior High School No. 4,
Trenton, N. J.

Ernest Sibley, Architect,
Lawrence C. Licht, Associate



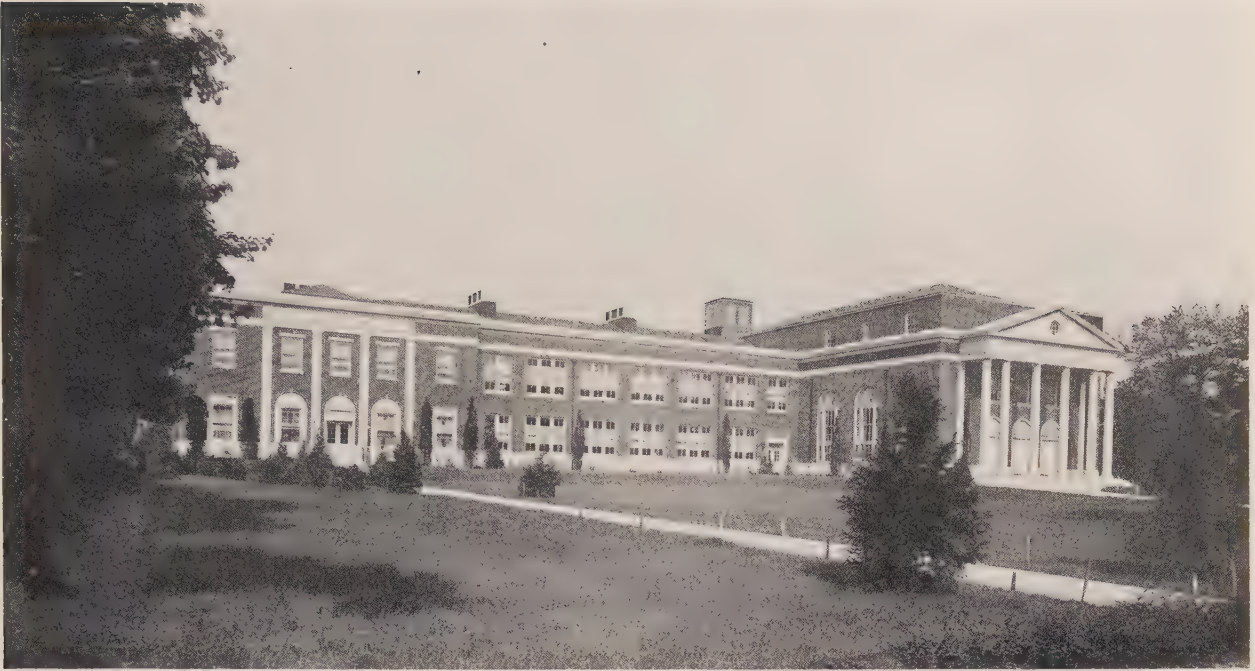
Flagpole Detail, High School Building,
Orange, N. J.

Ernest Sibley, Architect,
Lawrence C. Licht, Associate

period was divided into eight years of grade school and four years of high school, and has brought about the adoption of the new 6-3-3 system, departmentalization has not as a rule touched the lower elementary grades. The instruction during the first six years usually is still given to each class by its own teacher in its own classroom, with the help of such special instructors as, perhaps, the teacher of sewing, the drawing teacher, and the teacher of music who come to the classroom at stated intervals.

Departmentalization has in very many places extended downward through the spread of the junior high school idea. The junior high school has been created by taking two years from the end of the grade school period and the first year from the time otherwise allotted to high school instruction. The result is the 6-3-3 system, six years of elementary or grade school, three years of junior high school, and three years of senior high school. The object is to provide the best means of training the adolescent boys and girls who are neither grade school children nor high school young men and young women. It is a recognition of those who are in a transitional stage, as a group in between.

OF MODERN BUILDINGS



High School Building, Hempstead, N. Y.
Ernest Sibley, Architect, Lawrence C. Licht, Associate



High School Building, Orange, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate

THE PRACTICAL REQUIREMENTS



Detail of Tuscan School



Columbia High School, School District of South Orange and Maplewood, N. J.
Guilbert & Betelle, Architects



Tower and Main Entrance, Thaddeus Stevens Junior High School, Williamsport, Pa.
Guilbert & Betelle, Architects



Junior High School Building No. 3, Trenton, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate

The senior high school and the junior high school present the most interesting and complex problems. This departmentalization and the consequent specialization of classrooms is costly, and it is often more costly than it should be. It is part of the business of the architect, as well as that of the superintendent of schools and the school board, to keep this cost as low as is possible, consistent with satisfactory results. If the demands of everyone concerned were acceded to by the architect it would often happen that each pupil would be provided with three seats, if not more, counting the classroom, special classrooms and auditorium.

This means that if the cost is to be kept within reason, these rooms must be made to work constantly throughout the school day. If a chemical laboratory is not needed all day for this subject the physical laboratory should be combined with it and the instruction in physics as well as in chemistry given in this laboratory. The cafeteria is used only an hour or two each school day, for its special purpose, therefore, other uses must be found for it, it must be used as a study room, or for instruction in sewing, or for other special subjects to which the way in which it is furnished is suitable. On page 36 is shown a cafeteria so arranged that the service portion may be shut off with sliding doors when the room is in use as a study hall.

If the auditorium were used only for assembly, once a week or once a day, it would be the most extravagant of features, especially if large enough to accommodate a very large school. In the first place, where the number of pupils is large it is

now regarded as unnecessary to provide an auditorium of sufficient seating capacity to accommodate the whole student body at one time; they are taken in sections. A seating capacity of 1,000 or 1,200 may be regarded as the maximum. Then, too, other uses for the auditorium than for assembly are found; it is used for mass instruction in public speaking, for instance, or for visual instruction by means of motion pictures. Then, too, increasing use is being made of the school auditorium by the community. The auditorium should be accessible from outside the building, it should not be in the second or third story, but on the ground floor, so that the public may enter it without coming into the school proper and so that they will be safe in case of panic.

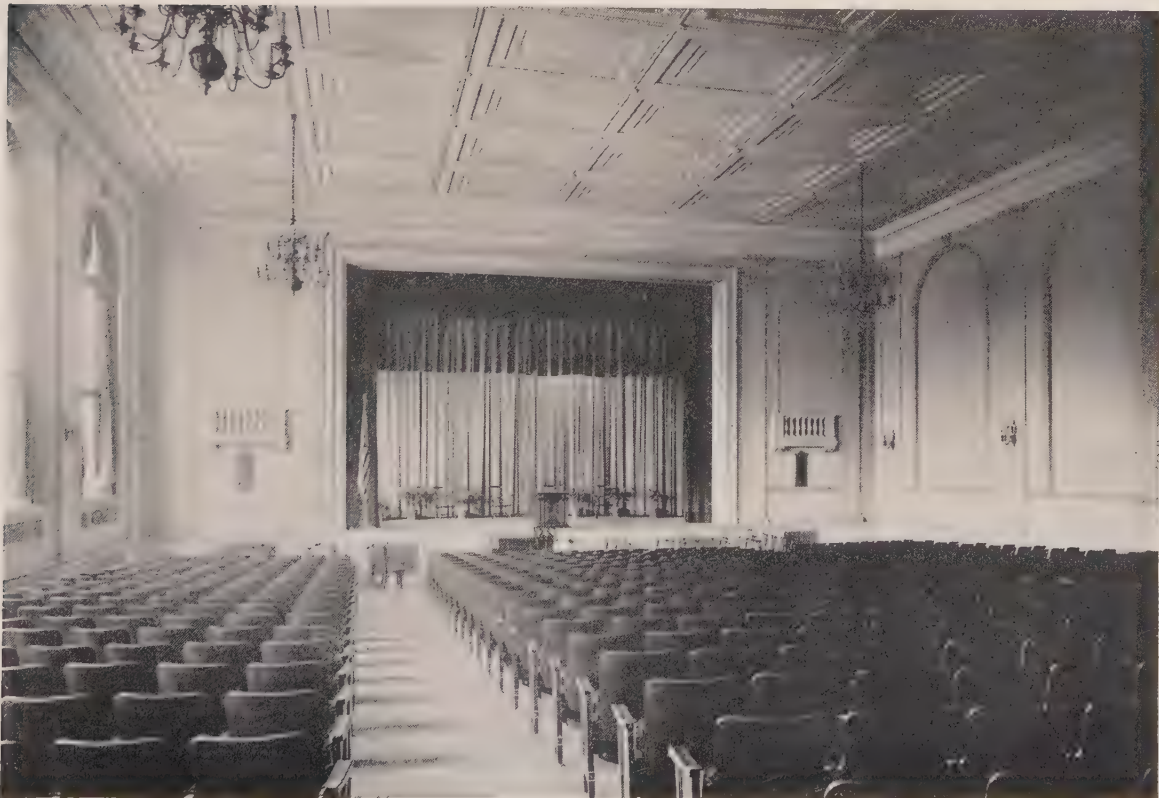
The floor of the auditorium should slope towards the front and the seating should consist of theatre chairs, with wooden backs and seats. The walls should be treated in some simple way to relieve the room of any sense of bareness. Panelling in slight relief serves this purpose well, as may be seen by referring to the view of an auditorium shown on page 39.

The daylight illumination of the auditorium should be from the side, not by means of a skylight, usually. The latter is objectionable because this way of lighting is unpleasant in effect when there are no windows, and for several more practical reasons. For one thing, a skylight in the ceiling may be dangerous. People walk on it, it gathers dust and dirt, and many such skylights leak. The light cannot be shut out for the showing of motion pictures unless curtains running on

OF MODERN BUILDINGS



Cafeteria, High School Building, Orange, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate
Used for study hall when sliding doors shut off service portion.



Auditorium, Junior High School No. 3, Trenton, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate

cords are drawn across the skylight, an arrangement that is ugly and a dust-catcher, or some other provision of a special nature is made.

The walls of the auditorium should be painted in a light, pleasant color, such as warm gray, or buff. The stage curtain should not be of a dark or strongly contrasting color. This fact is mentioned because of the tendency to choose a color for the curtain from a small piece of fabric without realizing that when the chosen color is seen in an area as large as that of the stage curtain it will be unpleasantly assertive. If the walls are painted a warm gray, the stage curtain may be of the same color, somewhat darker in tone. Old gold, mauve, taupe and light brown are good colors when used with walls of a color that harmonizes. Velours is the material best suited to the purpose, since it is rich looking and hangs well. It should be relieved with a little antique gold galloon trimming.

There should be a good stage in the auditorium. It should have a good background and it may have scenery, footlights, etc., in which case they should be installed in consultation with a man experienced in stage equipment. The stage need not be large enough to accommodate the graduating class, if the class is very large. This demand is sometimes made but it is better to seat them in the auditorium and reserve the platform for a few honor students. The size of auditorium allowable depends to some extent upon the community uses to which it may be put. If it is to be used for conventions, etc., this will have a decided bearing upon the size.

Provision for the showing of motion pictures is now made not only in planning the auditorium of the high schools or junior high schools but in



Portion of Elementary School, Massapequa, N. Y.

Ernest Sibley, Architect,
Lawrence C. Licht, Associate

other schools as well, and the fire underwriters' rules and all local regulations regarding the design and construction of the projection booth must be obeyed.

In planning school auditoriums, at least $6\frac{1}{2}$ sq. ft. should be allowed per person. This provides for the seats and aisles but not for the stage. This permits about 30 in. spacing back to back of seats 20 in. wide and usual aisles. A spacing of 32 in., back to back is better.

Another room that is big and of a very special character is the gymnasium. There still persist some old and erroneous ideas in regard to gymnasiums. The modern gymnasium is simply a

big plain room almost without apparatus. There may be a few flying rings, or a horse or some other piece of apparatus such as it is customary to associate with the idea of a gymnasium. The gymnasium of a high school or junior high school is used for class work by pupils who go through drills and calisthenics, in the nature of setting-up exercises, usually without the use of even Indian clubs, dumb-bells or wands.

For another thing the pupils do not perspire sufficiently to require a change of clothing and a shower, so sufficient shower baths, dressing and locker facilities for the whole class are not needed usually. A half locker for coat and "sneaks" is enough for a class pupil, excepting for the members of the teams, who need full lockers. The boys and girls usually take the exercises without changing their clothing. However, in some schools the period is made long enough to permit of the shower and changes of clothing. In school gymnasiums there are often two classes of sixty, seventy or eighty pupils at a time. Sixty is the usual number of pupils in a class under one instructor.

The clear height of a gymnasium may well be



Fulton Elementary School, Hempstead, N. Y.
Ernest Sibley, Architect, Lawrence C. Licht, Associate

from sixteen to twenty-two feet, but from eighteen to twenty feet is a good height. The size of the floor of the gymnasium is fixed, usually, by the space required for a basketball court, since this takes more room than any other of the activities carried on in this room. Basketball courts vary from 35 ft. x 60 ft. to 50 ft. x 90 ft. The Y. M. C. A. standard gymnasium is 50 ft. x 80 ft. In addition to the court of the sizes mentioned a space three feet wide, at least, is needed on all sides of the court. Therefore, the minimum size for a gymnasium that has a basketball court of recognized size is 41 ft. x 66 ft. A court of 50

ft. x 90 ft. may be regarded as of very liberal size. Basketball is often played in smaller gymnasiums than those permitting a standard size court.

The question of space for spectators at games played in the gymnasium often comes up during the planning of a high school. The pupils are likely to want their parents and friends to witness the games and it seems to be desirable to provide standing room for a limited number of spectators and perhaps a few seats. The demand, which is sometimes made, that a gallery with seats be provided for spectators may be regarded



Elementary School, Massapequa, N. Y.
Ernest Sibley, Architect, Lawrence C. Licht, Associate

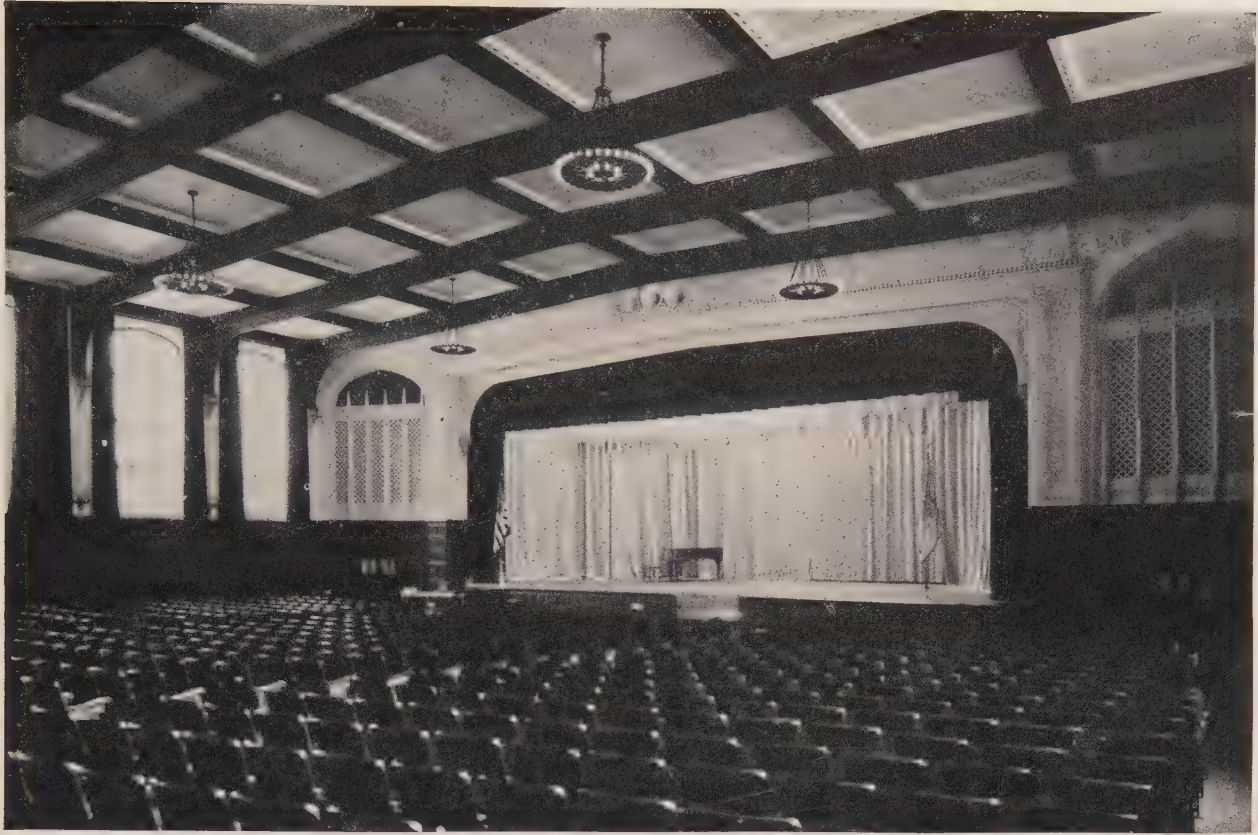
THE PRACTICAL REQUIREMENTS



Swimming Pool, Junior High School No. 3, Trenton, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate



Gymnasium, Junior High School No. 3, Trenton, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate
Note recessed folding doors to divide double gymnasium.



Auditorium, Columbia High School, School District of South Orange and Maplewood, N. J.

Guilbert & Betelle, Architects

as unreasonable in many cases because of the expense. Often keen rivalry develops between the basketball teams of different schools and the students and citizens take an interest in the games, therefore, the accommodation of spectators is desirable within the limits of proper expenditure. The community use of the schools is increasing and is desirable, but the construction of unusual or excessive accommodations for the public is a thing to be guarded against in order that things more essential need not be unduly limited.

A school gymnasium should be well lighted and airy. There should be windows on two sides, or on three sides if possible, and the windows should extend well down towards the floor. The windows should be screened with heavy wire mesh, and the walls should be indestructible. They should be of light gray or light buff brick or, if of common red brick, they should be painted a light, pleasant color. The floor should be of maple.

In the case of all special rooms, such as the chemical laboratory, domestic science room, manual training workshops, etc., the layout of equipment should be studied fully at large scale to determine the size of the room and its shape in the preliminary stage of the planning of the building. In doing this it is important that the architect secure roughing-in measurements for all of the equipment to be installed, obtaining drawings from the manufacturers of the equipment.

The furniture should be selected tentatively and provision for the accommodation of every piece should be made on a large-scale study of the plan of the room. It is only in this way that the general plans may be worked out satisfactorily, by knowing definitely what space each room or department will need. The general tendency of architects is to make these special rooms too small. Special rooms usually require from $1\frac{1}{2}$ to double the floor area required per pupil in the regular classrooms, because of the space occupied by the special equipment, the furniture and the working space needed.

The number of pupils in special classes, such as cooking, chemistry, sewing, etc., naturally varies, but 24 may be taken as the usual number under one teacher at a time. In the regular classrooms, 30 to 35 pupils in each class may be taken as usual for a senior high school, 35 for a junior high school, and 40 for a grade school.

The number of pupils to be accommodated determines the size of the classroom, for the number of square feet or cubic feet per pupil is fixed by state law in most states and the architect needs to familiarize himself with the laws of the state in which the school is to be built. In New Jersey, the requirement is 18 sq. ft. per pupil. To accommodate a class of 40 pupils, this, of course, calls for 720 sq. ft. of floor area, which may be provided by a room 24 ft. x 30 ft., a room



Junior and Senior High School Building, Fort Lee, N. J.

Ernest Sibley, Architect, Lawrence C. Licht, Associate

of convenient size and of good proportions. When 18 sq. ft. per pupil are allowed the ceiling may be as low as 12 ft. unless the law of the state calls for a greater number of cubic feet per pupil than this provides. Some states fix the minimum ceiling height. Ceilings in classrooms should never be less than 12 ft. high. In New York state the requirement is 15 sq. ft. or 200 cu. ft. per pupil. This of course calls for a ceiling more than 12 ft. high or more than the minimum square feet. In Ohio the requirement is 16 sq. ft. per pupil in grade schools, 18 sq. ft. per pupil in intermediate schools, and 20 sq. ft. per pupil in high schools. These figures give a general idea of the space needed and they indicate the considerable variation in requirements in different states.

A word may well be said here regarding two requirements for the kindergarten—that it is important not to overlook, namely, that it should be on the ground floor, the small pupils should not be made to climb stairs, and that it should not be built with its floor laid directly on the ground. A concrete floor laid on the earth may serve well for the other rooms, but there should be an air space under the floor of the kindergarten, at least, to prevent the floor from being cold and damp, because the children sit and play on the floor. The kindergarten should be a complete unit, with its separate entrance, toilet and drinking fountains as well as its own classroom, so that the little pupils do not have to go into the main halls among the larger children and will find all their needs cared for in their own section.

Wooden floors are now largely used in classrooms and they are treated in many cases with a preparation which fills the pores of the wood and gives a good wearing surface. School floors should be

treated so that they are not dusty. Walls are painted in pleasing, warm colors and the rooms in general have a much more homelike appearance than the rooms that were used a few years ago. The children in school nowadays are healthy—those who are not are not permitted to attend. The school nurse and the doctor see to this.

The advance of medical science and better sanitation in homes have done much in the past twenty years or so for the public health. Many of the precautions that may have been necessary, but that were no doubt very largely the product of over-zealous application of the newly-discovered principles of sanitation, are no longer necessary. The schools of today need to be no more “hospital like” than the homes of the pupils, though air, sunshine and cleanliness are as important as ever.

The junior college is a coming feature, for it is designed to take care of the very large number of pupils who desire to continue their education beyond the present high school course and who cannot afford to go to college.

There are many other details which should be noted, such as artificial lighting, watchman's signals, call system, interior telephones, fire alarms, etc.

One of the greatest improvements in the planning of schools is in providing administration rooms which are often lacking in the older schools. There should be a place for the nurse, visiting doctor, rest room for teachers, room where the school paper may be gotten out, a place for meetings of the athletic association, and other meetings connected with the school. There should be a library in every elementary school, and a medical department. Providing facilities for clerical work is highly important, as it makes possible the keeping of records and correspondence



Greenwich High School, Greenwich, Conn.
Guilbert & Betelle, Architects

THE PRACTICAL REQUIREMENTS



Franklin Elementary School, Hempstead, N. Y.
Ernest Sibley, Architect, Lawrence C. Licht, Associate



Administration Wing, Lincoln School for Colored
Children, Trenton, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate

OF MODERN BUILDINGS

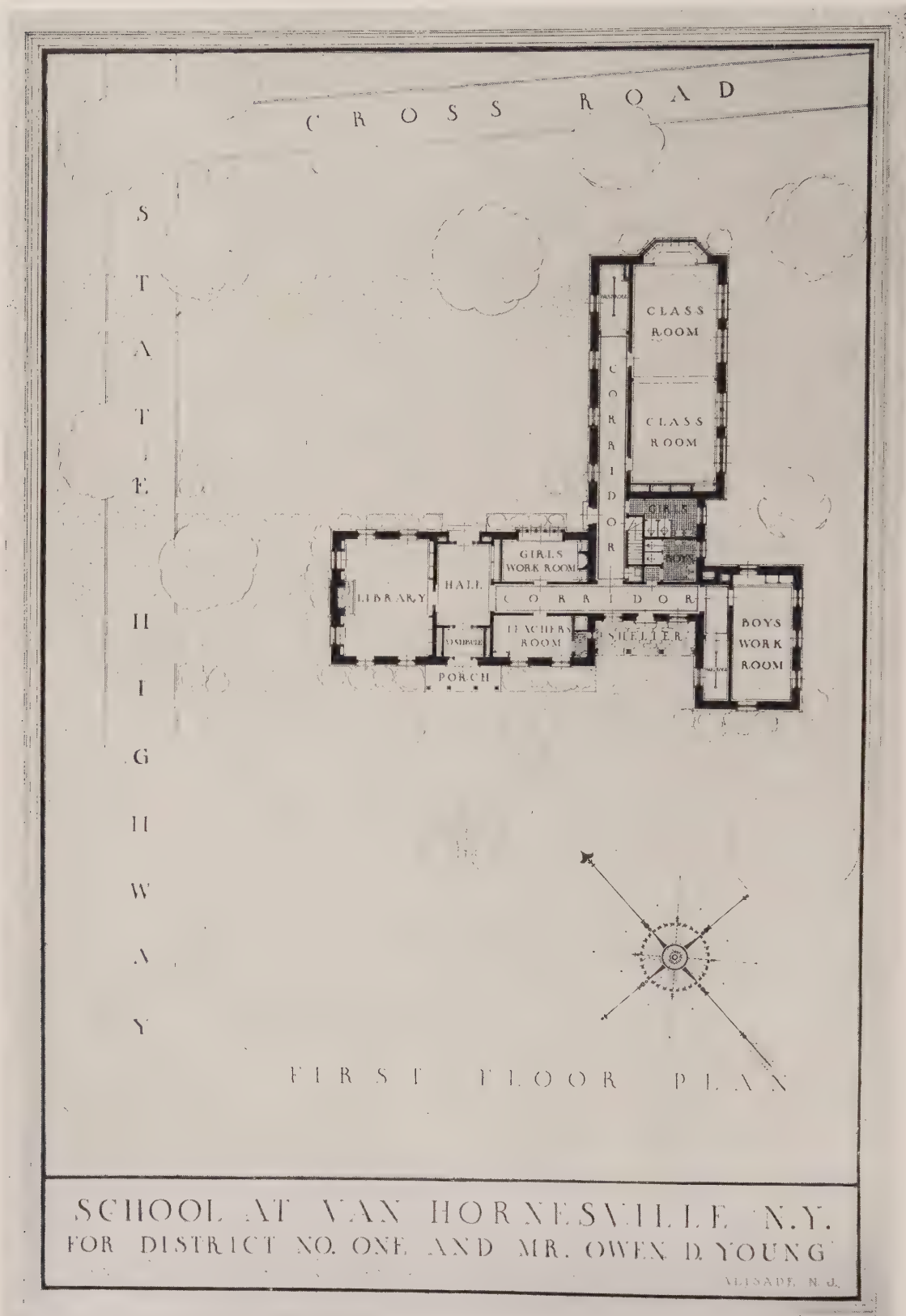


Library, High School Building, Orange, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate



Library, Junior High School No. 3, Trenton, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate

THE PRACTICAL REQUIREMENTS

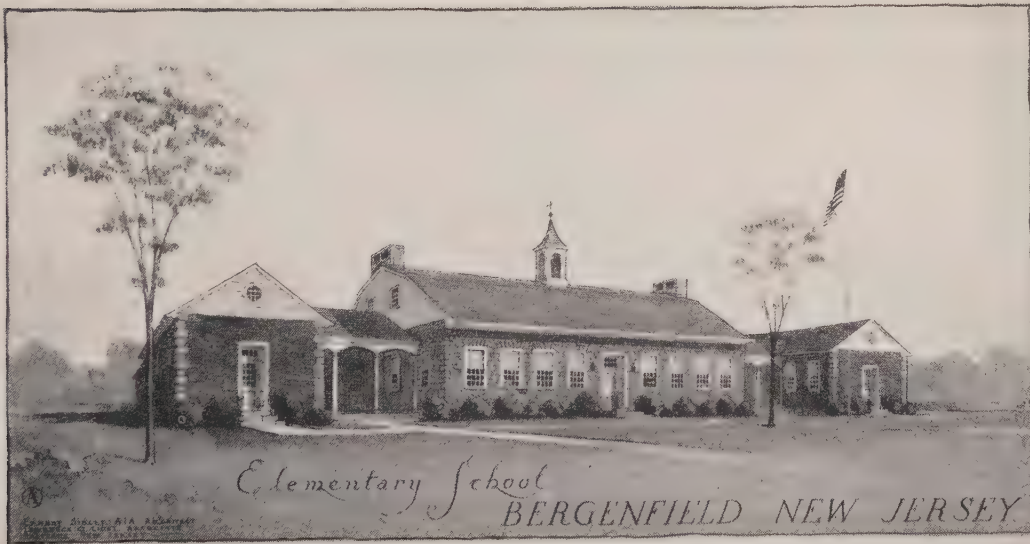


School at Van Hornesville, N. Y.
Ernest Sibley, Architect, Lawrence C. Licht, Associate

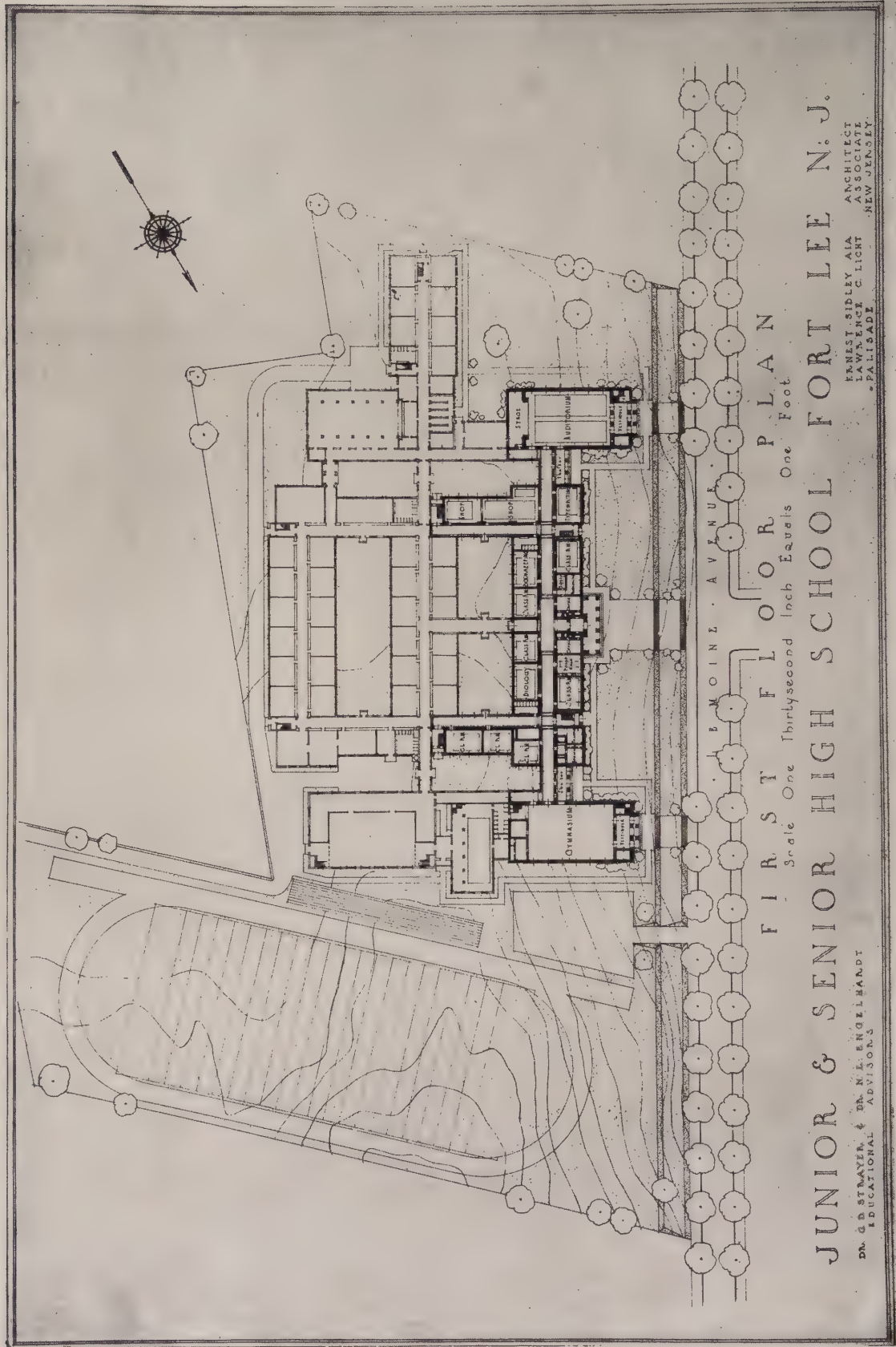
OF MODERN BUILDINGS



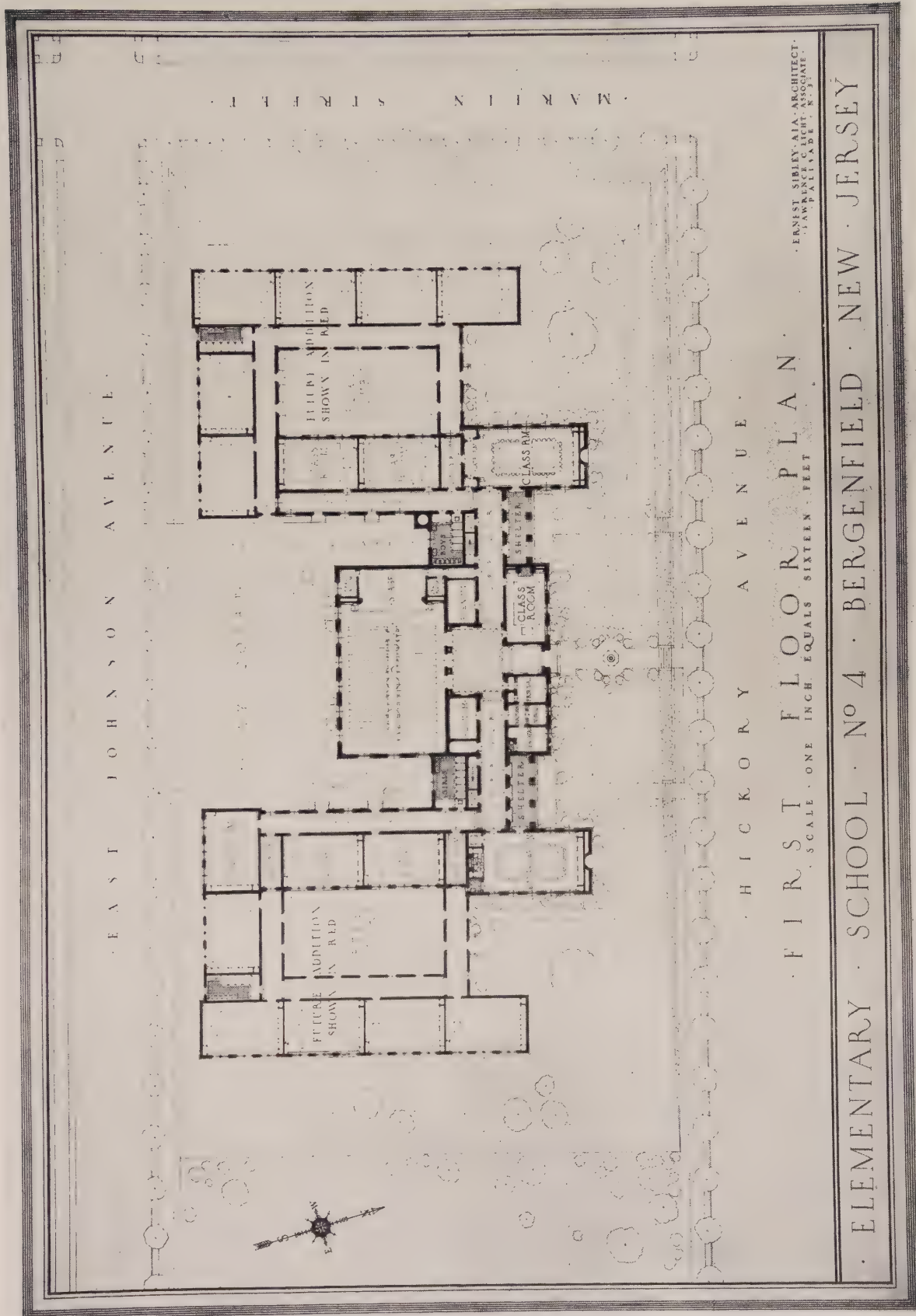
Elementary School, Van Hornesville, N. Y. Gift to School District No. 1 from Owen D. Young, Esq.
Ernest Sibley, Architect, Lawrence C. Licht, Associate



Elementary School, Bergenfield, N. J.
Ernest Sibley, Architect, Lawrence C. Licht, Associate

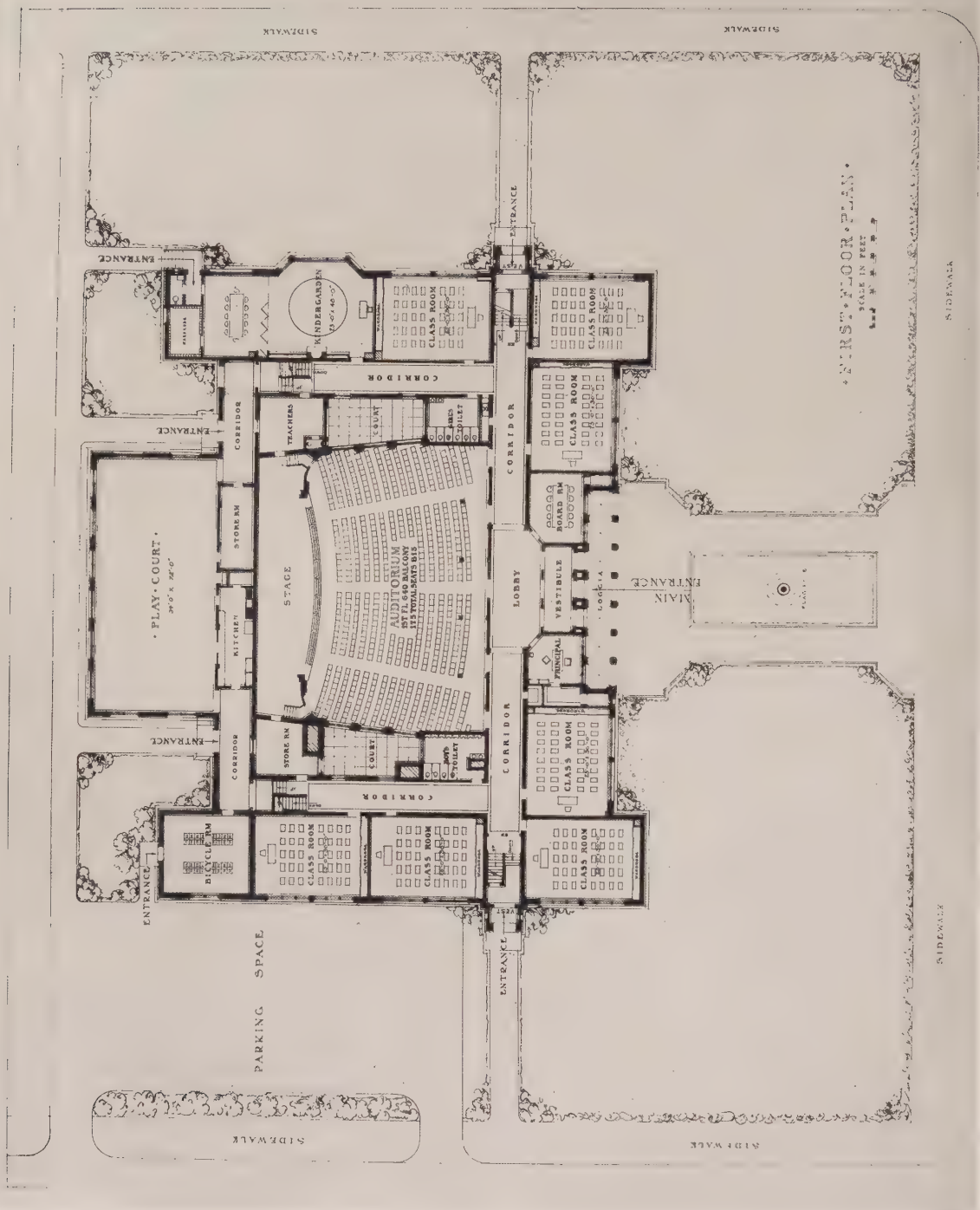


Junior and Senior High School, Fort Lee, N. J.
Ernest Sibley, Architect, Lawrence C. Light, Associate



First Floor Plan, Elementary School No. 4, Bergenfield, N. J.
Ernest Sibley, Architect, Lawrence C. Light, Associate

THE PRACTICAL REQUIREMENTS



First Floor Plan, Clifton Avenue Grade School, Lakewood, N. J.
Guilbert & Betelle, Architects



Auditorium, Thaddeus Stevens Junior High School, Williamsport, Pa.

Guilbert & Betelle, Architects

Folding doors at back of stage open into the gymnasium.

by clerks who relieve the principal of these details and leave him free to devote his attention to more important duties.

A member of the organization whose requirements should be kept in mind is the janitor, who should be an able man, have proper assistants and suitable space in the building.

A present-day development is the swimming pool which is important not only as a means of physical development but through the instruction it makes possible, it cuts down loss of life through drowning. But there must not be a swimming pool unless enough money can be allotted to this feature to make it thoroughly good, for unless it is tiled, and has an effective equipment for sterilizing the water it is dangerous as a means of causing and spreading disease.

The cafeteria is usually competent to take care of itself financially and is much better for pupils than the lunches which they are likely to obtain outside of the school. School cafeterias provide food at cost and still pay their own way.

Further details as to the requirements for the different special rooms should be obtained through consultation with the school superintendent, the principal, and other school authorities and through conference with the men whose business it is to manufacture and install the various kinds of equipment needed.

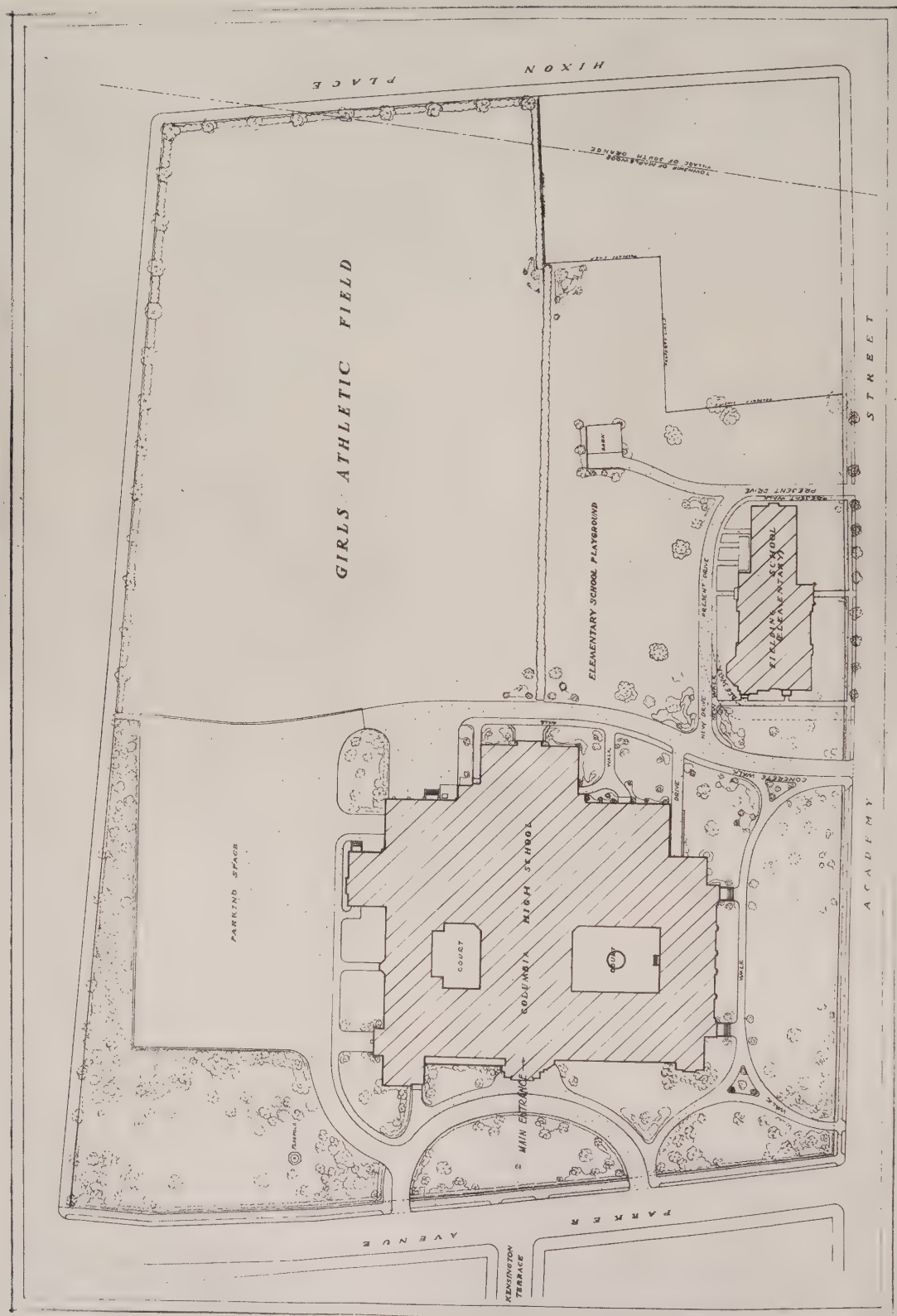
For further study the following works are

recommended: the article on "School Planning" by James O. Betelle in Hoole & Johnson's "Handbook of Building Construction," Vol. I, published by the McGraw Hill Book Co., the "Checking Schedule for School Buildings" by James O. Betelle, published by the Bruce Publishing Co., Milwaukee, Wisc., the "Code of Lighting for School Buildings" by the American Engineering Standards Committee, "School Architecture" by John J. Donovan, and the "School Board Journal."

Next to the requirements arising from the nature of the educational work to be carried on in the building come the requirements that arise from the nature of the site, the need for planning the building in such a way that the orientation of the rooms will be right, etc.

The orientation of schoolrooms presents a problem upon which there is some difference of opinion among authorities. All agree that a schoolroom should not face directly south, as the flood of sunshine throughout the school day makes the proper control of light and temperature very difficult. Most people who have to do with schoolhouse planning believe that a schoolroom should face east or west, more or less. It is upon the matter of making a room face the north that the sharp disagreement exists. It is maintained, on the one hand that when a room faces the north the light is steady throughout the day, it

THE PRACTICAL REQUIREMENTS



Plot Plan, Columbia High School, School District of South Orange and Maplewood, N. J.
 Guilbert & Betelle, Architects

is a good working light, there is no difficulty about controlling either light or temperature since there is no direct sunlight. On the other hand it is pointed out that a sunless room lacks cheerfulness and that sunlight is beneficial in keeping a room wholesome. The law sometimes requires that there shall be sunshine in every classroom for at least a portion of each day—it is so in New York State.

The way out of this disagreement seems to lie in the usual practice of facing the classrooms east or west in general, so far as possible, having few if any of them facing either directly north or south, and placing rooms at the north or south that may well be so located because of the nature of the work to which they are devoted. For instance, a room that has a southerly exposure, more or less, is good for the biological laboratory, since it favors the growth of plants and other specimens placed in the windows, while a northerly exposure is good for the classrooms in drawing. The drawing done in a school classroom seems to hardly require a north light if the room cannot be so placed conveniently, however. Workshops may well have either a northerly or southerly exposure, preferably the former. Rooms other than classrooms, such as administration rooms, entrance halls, etc., may well be at the south.

From what has been said above it is apparent that a site that faces either in a general easterly or in a general westerly direction is best suited for a school building. But the property not infrequently is on the north or south side of a street, and in that case the architect must plan the building so that the classrooms have the proper orientation despite the orientation of the site. The ways of doing this readily occur to the architect. There are well known schemes for making the parts of the plan containing the classrooms run approximately north and south, such, for instance, as the H-shaped plan with the crosspiece parallel to the street. Where the school can extend north and south the I-shaped plan is much liked, with the gymnasium at one end and the auditorium at the other end wider than the classroom section.

After the requirements of the educational program and of the location, those relating to construction may be regarded as next in importance. A school needs a waterproof roof, waterproof foundation, substantial walls, and good floors, good ventilation and heating. Everything about it should be sound in construction, materials and equipment. A school building has to withstand the wear and tear of thousands of children; it needs to be rugged. Good sound materials and good construction are much more important than a showy appearance and if there is need to go without one or the other, sturdy simplicity should be chosen rather than elaboration associated with the substitution of cheap imitations of good materials.

One of the outstanding features of modern schoolhouse design is the practical elimination of the basement. A basement is unnecessary and undesirable. It is expensive and useless. Furthermore, if there is a basement, sooner or later children will be placed in it, a thing to be avoided by all means. There are traditions that have it that the basement is the right place for manual training workshops, and for certain other rooms. This probably came about because when these features were introduced there was no other place for them, and the idea took root that they must always remain in the basement. The toilet rooms should not be in the basement.

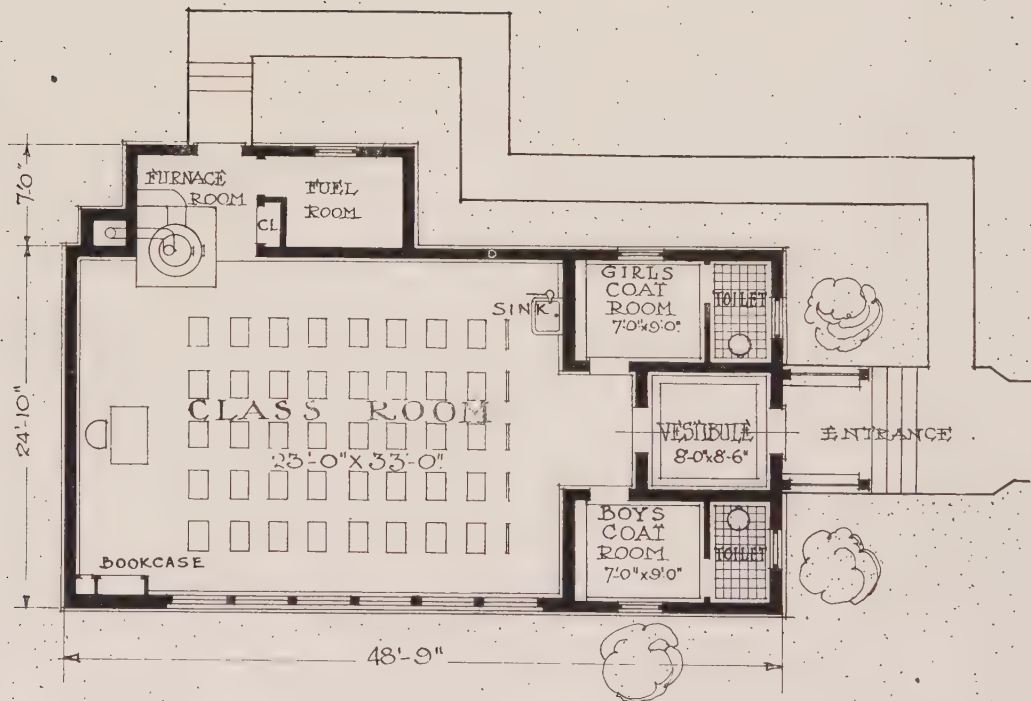
Much better than building a school with a basement is the method of building it with a concrete slab on the ground and an air space between this slab and the lowest floor. A basement is then needed under only a part of the building, big enough to house the heating plant, etc. And it is desirable not to have the heating plant in a deep basement; it is well to place it so that it is largely above ground.

Another method of building a school without a basement that is largely used now is to lay the first floor directly upon the earth, making this floor of a concrete slab properly waterproofed and placing the finish floor of wood directly upon it. In this case the pipes for heating, etc., are carried in pipe galleries in the ground around the building. While this costs less than building with a slab on the ground and an air space between it and the floor, the advantages of the latter method seem to be great enough to justify the larger expenditure where the money is available.

The requirements relating to the design character of a school properly come next in order. Fortunately the standard of design for public schools has been raised greatly in the past few years and school authorities are often more liberal in this direction now than they were formerly.

In the first place a school should look like a school, and it should look like the kind of school it is. An elementary school may well be simpler than a high school, and a school for vocational training may well look more or less like a factory. Often there are local traditions upon which the design character of the building may be based; for instance, Guilbert & Betelle chose for their Greenwich High School good Colonial precedent because Greenwich is known as "The Gateway to New England," while the same architects employed French Gothic in designing a high school for New Rochelle, which was settled by the French Huguenots. When there is a university in the town the architecture of the university buildings may well set the style for all the other educational buildings. If, for instance, the university buildings are of English Gothic design, of the kind sometimes called "Collegiate

THE PRACTICAL REQUIREMENTS



One-teacher School, Seaford, Del.
Guilbert & Betelle, Architects

Gothic," this fact may well influence the design of the public schools. This gives an air of consistency and is logical, since the university stands at the head of the educational activities, whether or not there is any official connection between it and the public school system.

In any case the design of a school building should be simple, dignified and free from the pretentiousness that has not infrequently marked the design of important school buildings. It may be taken as a general rule that a school should not be monumental in character. State capitol traditions are out of place in a schoolhouse, however large the school may be. The school building should fit into its surroundings. It should not look like a bit of some larger city picked up bodily and set down on the site. A school in a small town or in a rural community should have much of the character of the domestic architecture of the community, of the homes that line the streets or roadways about it. The Colonial farmhouse or cottage architecture forms a good source of inspiration for the design of school buildings of this kind. A number of schools of this character are shown in the photographs herewith.

The biggest problem confronting school authorities and the architects of school buildings at the present time is that of securing the highest degree of efficiency. So far as the buildings are concerned this means getting the maximum amount of service out of the buildings. At the present time many school buildings as well as many of the methods of instruction in use throughout the country are costing more than necessary for the results obtained. In many cases costly school buildings are used only five hours a day, 200 days a year. The problem is how to make the school buildings work a greater part of the time and to get as much use as possible out of each room in the building.

Some school authorities are in favor of the use of the school throughout the year for the instruction of children and in some places longer hours have been adopted. The custom of having a long summer vacation seems to have originated in this country in the days when farming communities set our standards. During the summer the boys and girls were needed to help in the farm work. During winter, when they were relieved of this work they could go to a school, but in most communities today this condition does not exist and it is maintained that school should continue throughout the summer months.

It is argued that in a great many communities it is much better for the children to be in school throughout the year and the greater part of the day because the parents are not able to exercise proper supervision over them. This may apply to the industrial population of many localities. It is declared that children in many communities

are much better off in school than they would be in the streets. It is a suggestion that affords a way of getting more work out of the school buildings, certainly, and it is being tried in a number of places.

The use of the same schoolroom for different school purposes is a matter that more directly concerns the architect and it is a matter upon which there is likely to be less difference of opinion. It may be said that the greater the number of uses each room in a school can be put to, the better. But rooms should not be used for purposes to which they are ill suited. It is better to let rooms stand idle part of the time than to combine uses when the facilities are not suitable. Casual mention has been made of the fact that the cafeteria is often used at times other than the lunch hour for instruction in sewing and in other subjects and sometimes as a study hall. The auditorium is frequently used for instruction in public speaking, or for mass instruction in other subjects, including visual instruction through the use of motion pictures. Instruction in physics and chemistry is often given in the same classroom which is equipped both as a physical and chemical laboratory. These examples point the way to the duplicate or multiple use of schoolrooms. But this must not be carried too far.

In a further effort to make the school buildings work as much as possible the school authorities in many places are encouraging the use of the school buildings for community purposes so far as possible. The auditorium is sometimes used for conventions and other gatherings. Dances are held in the gymnasium and smaller social gatherings in the kindergarten at night. In this way the school buildings are made to serve the public to an increased degree and the expense of the construction and maintenance of these buildings need not be considered entirely as an outlay for the instruction of the children. Nothing should be too good for the children, but if their elders can also make use of the school buildings so much the better.

The school building may be regarded as an industrial plant in which the industry carried on is the instruction of children. Throughout the planning, in general and in detail, efficiency in the accomplishment of this end should be the main thought and the various parts of the building should be so co-ordinated that there will be a minimum of lost motion in the working of the school, there should be no waste of time or loss through the avoidable idleness of the whole or of any part of the building. The school building should be substantial in construction and pleasing in appearance, without undue elaboration. Meeting the practical requirements is the architect's first concern, the design character of the building is second in importance to this.



The Sanctuary
Church of the Holy Innocents, Brooklyn, N. Y.
Helmle & Corbett, Architects

CHAPTER IV

RELIGIOUS BUILDINGS

CHANGES have taken place rapidly in the requirements for churches, synagogues and the buildings needed to accommodate the social or community activities connected with them. Some of these changes have grown out of the congested condition and high land values that exist in the great centers of population. Others have developed from the growth of a desire for better religious buildings in the smaller cities and rural districts. A general desire for improvement has been at the back of these changes and a number of entirely new and excellent ideas have been introduced. The great activity in the building of synagogues during the past few years, and the very large sums of money expended in the construction of synagogues and of temple houses, has brought about a thorough study of the problems presented by these buildings and has set a very high standard.

Where high land values have constituted a problem to be met by the members of a church and their architect various ways of solving the problem have been found. In some cases the vertical extension of the building, the piling up of all the rooms needed, one on top of the other, has been the chosen method. This has been done in such a way as to produce an exterior that is admirable from the standpoint of architectural design while the internal arrangements satisfy the practical requirements and are pleasing in effect in the Park Avenue Baptist Church, New York City, Henry C. Pelton and Allen & Collens, associated architects.

The requirements called for a church, parish

house and a Sunday school on a lot only 80 ft. x 100 ft. The church auditorium occupies the main floor to the height indicated by the top of the aisle portion that may be seen in the photograph on this page. The windows showing above the aisle roof are those of the women's society rooms, which occupy the entire clerestory above the church auditorium. In the roof are the Sunday school rooms. Under the main auditorium are the men's society rooms, in a high basement.

The problem of securing an entrance of suitable dignity without using too great a part of the depth of the lot for this purpose has been well solved. The main portal has been placed at the right-hand side of the front. It can be seen at the extreme right of the photographic view on this page. Back of the main portal is an entrance vestibule at the back of which are the staircase and the large elevators, two in number, which serve all of the floors. Extending across the front of the building, under the large window, is the narthex. This wide passage extends from the vestibule of the main entrance to the secondary staircase in

the corner of the building and to the small portal opening from it upon the side street just back of the corner. Entrance to the auditorium from the narthex is had by means of three double swinging doors.

Now, Henry C. Pelton and Allen & Collens, the architects of the Park Avenue Baptist Church, are building a much larger church, for the same congregation—the Riverside Church at Riverside Drive and 115th Street. In this church the



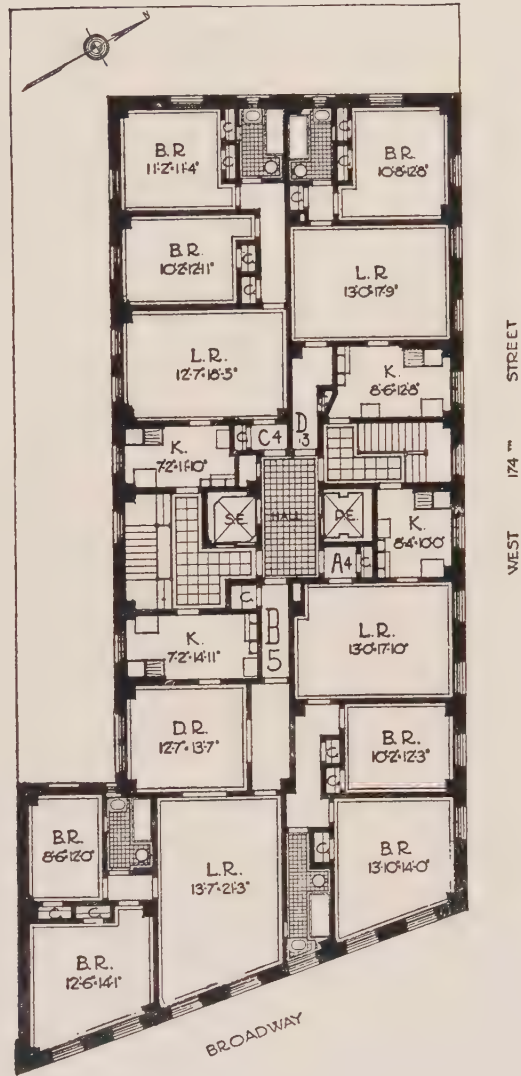
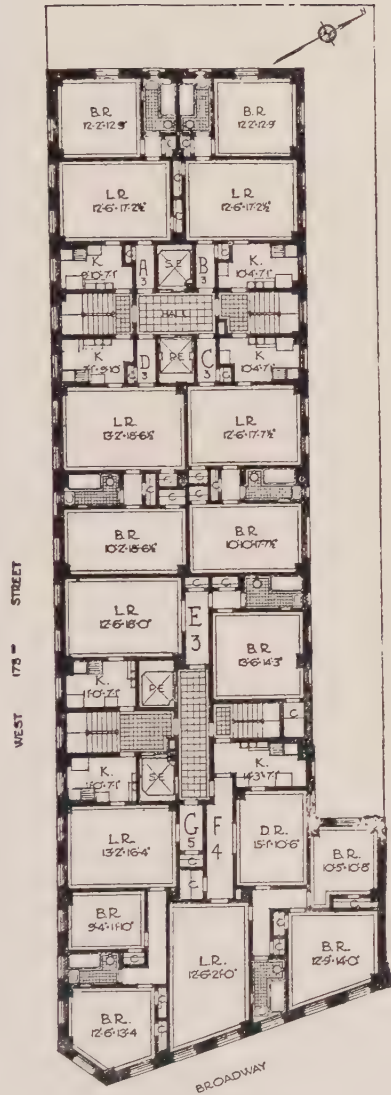
Park Avenue Baptist Church, New York City

Henry C. Pelton and Allen & Collens,
Associated Architects



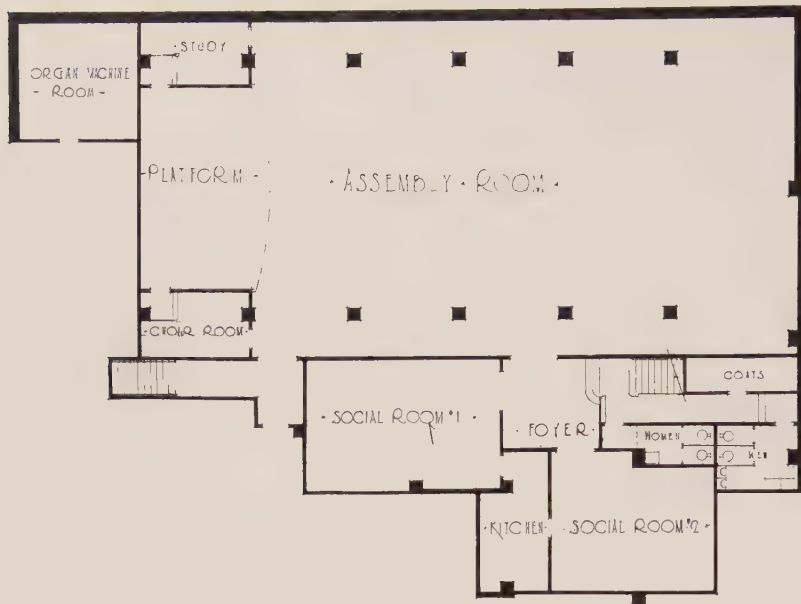
The Broadway Temple, New York City, Donn Barber, Architect

OF MODERN BUILDINGS



Floor Plans of Apartment House Wings of the Broadway Temple, New York City
Donn Barber, Architect

THE PRACTICAL REQUIREMENTS



Rooms for Sunday School and Social Activities of the Church, in the Basement.



Typical Floor Plan of the Apartment House.

Chelsea Presbyterian Church and Cartaret Apartment Hotel, New York City
Emery Roth, Architect

various parts are disposed above and below the main auditorium, on the same general principle as the arrangement of the Park Avenue Baptist Church.

This piling up of the parts of a church instead of spreading them along the ground is not only an expedient that prevents the extravagant use of land where land is costly, but it results in a building that has sufficient height to be imposing when surrounded by other buildings, as a city church necessarily is. That it lends itself to very successful design treatment in the hands of able architects is proved by both the Park Avenue Baptist Church, which is shown here, and by the design of the Riverside Church which is now under construction.

In the case of the Park Avenue Baptist Church, much of the effectiveness and dignity of the design are due to largeness of scale, and to simplicity and massiveness. The fine enrichment has been confined to the upper part of the tower, to the window in the nave at the front, and to the smaller windows above it. This enrichment has for a foil, to enhance its beauty and effectiveness, the simple, bold masses of walls and buttresses.

Fortunately the practice of building churches of small or moderate size that look like big churches photographed down and stripped of their enrichment has passed. The present tendency to design churches of moderate size as though they were chapels of some great cathedral that might be built at some later date gives them the bigness of scale that is necessary to proper dignity.

One way of designing a church for a location in which the high value of land is a controlling factor has been considered in the dis-

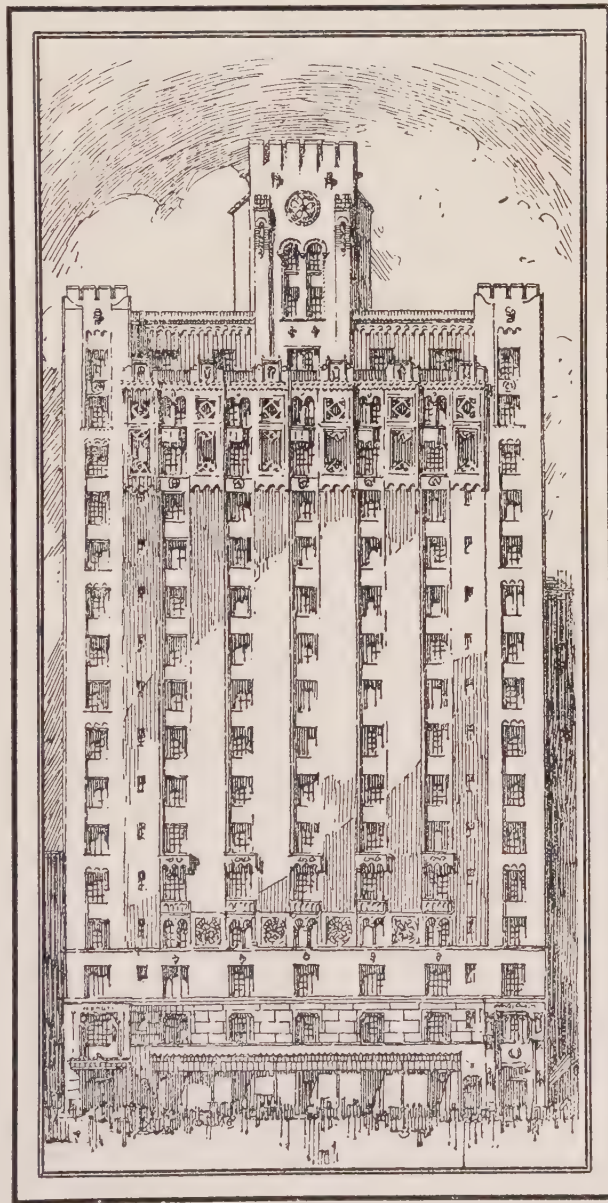
cussion of the Park Avenue Baptist Church, but there are other ways besides piling up the parts of the church. One of these ways that is being received with favor is to incorporate the church and its dependencies in a building that is to be used largely for other than church purposes, to build the church in combination with apartments or offices to be rented, or with a hotel building.

The outstanding example of this method of solving the problem at the present time is the Broadway Temple, New York City, designed by the late Donn Barber as the crowning work of his professional career.

The Broadway Temple is under construction at Broadway and 173rd Street to 174th Street, New York City. The design calls for a massive structure topped by a shining cross of electric lights 719 ft. above tidewater and visible for many miles. A perspective drawing of the Broadway Temple is reproduced on page 54. The tall central portion will contain in its lower part the church auditorium. Under the auditorium, and extending under the lower parts of the buildings to the north and south, will be the rooms for the Sunday school and for the social activities of the church.

Above the church auditorium will be a swimming pool and a gymnasium. Occupying the great tower from this point upward will be a big modern hotel. The placing of the gymnasium and swimming pool between the church auditorium and the hotel will make this feature of the building easily accessible from both the church and the hotel.

The lower portion of the building at the north and south will be complete apartment houses. Typical floor



The Chelsea Presbyterian Church and
Cartaret Apartment House,
New York City
Emery Roth, Architect

plans of the apartment house wings of the Broadway Temple are reproduced on page 55.

A building that is of wider practical interest because it is of smaller size and, therefore, affords a solution of this problem that may be adopted by many city congregations is the new Chelsea Presbyterian Church combined with the Cartaret apartment hotel on West Twenty-third Street, New York City, by Emery Roth, architect.

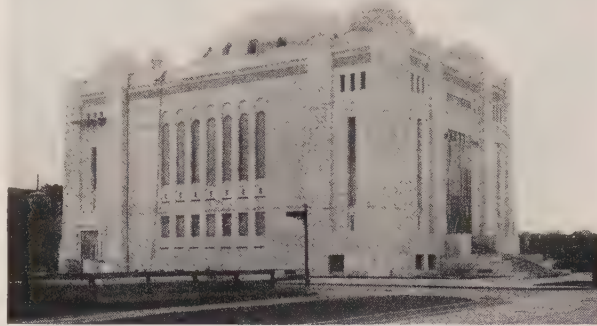
The front of this building is shown in a pen-and-ink drawing of the front elevation. By reference to this elevation and to the ground floor plan it will be seen that the entrance to the apartment hotel is at the extreme left and the entrance to the church at the extreme right, with a row of five stores between them. A long vestibule leads to the hotel lobby upon which are arranged the usual hotel offices, with place for the clerk, etc., also the elevators. Another long vestibule leads to the church auditorium, which occupies the entire rear part of the building on the ground floor, and extends through the second floor. In the basement, under the church auditorium, is the assembly room, used for church meetings and for the Sunday school; here also are the kitchen, the rector's room, the study, the organ machine room, toilets and coat rooms. The basement rooms are reached by a staircase from the entrance lobby of the church, on the first floor, and a second exit is provided by a staircase at the front of the

assembly room, that leads to the lobby of the hotel. From the front of the church auditorium a door opens upon a short passage leading to the hotel lobby, providing a second exit from the auditorium.

Combining a church with a building that is used largely for other purposes is not a new idea, of course. There are several notable examples in various

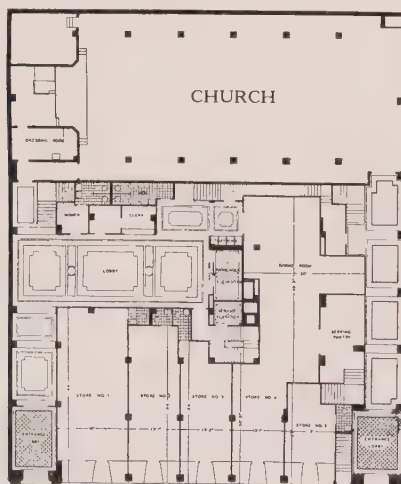
cities, built some years ago. But the pressure of high land value is stronger than ever and consequently the expediency of adopting this plan appeals to more congregations than it did formerly, also the prejudice in some quarters which retarded the progress of the idea seems to be lessening.

The building of the new Chelsea Presbyterian Church, illustrated here, is a case in point. Some twenty-five years ago, the Rev. Dr. John Lloyd Lee was pastor of the Westminster Presbyterian Church, as it was then called, which occupied a dignified Gothic stone church building, with adjoining parsonage, on the site of the present building. At that time Dr. Lee started a movement to build a new church combined with a building to be used for other purposes that would produce a revenue. Dr. Lee pointed out that with the rising value of land many sections of every large city would be churchless unless something of the kind were done to enable the downtown churches to stand their ground. Bitter opposition to this proposal was followed very shortly by

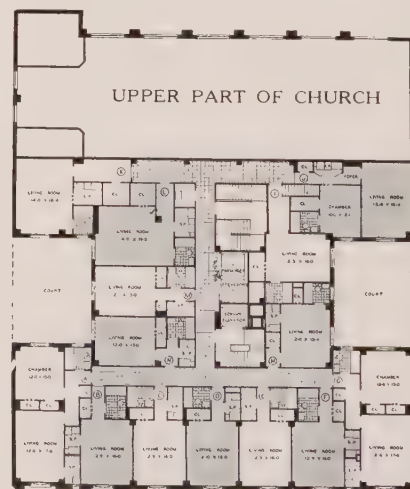


Temple Israel, Boston, Mass.

C. H. Blackall, Architect



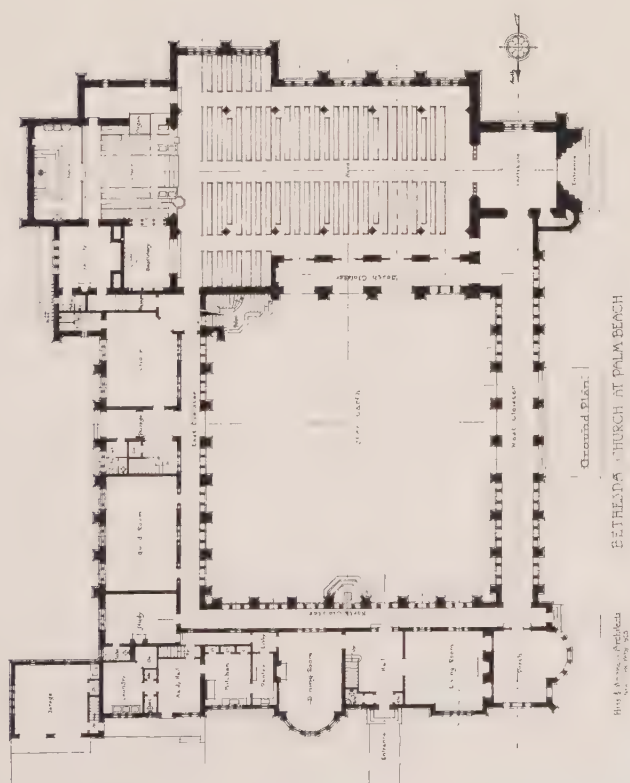
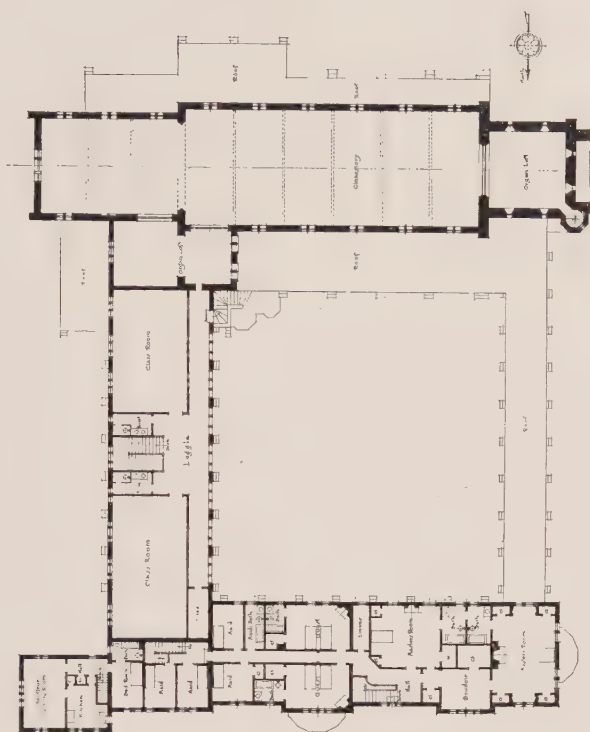
First Floor Plan



Second Floor Plan

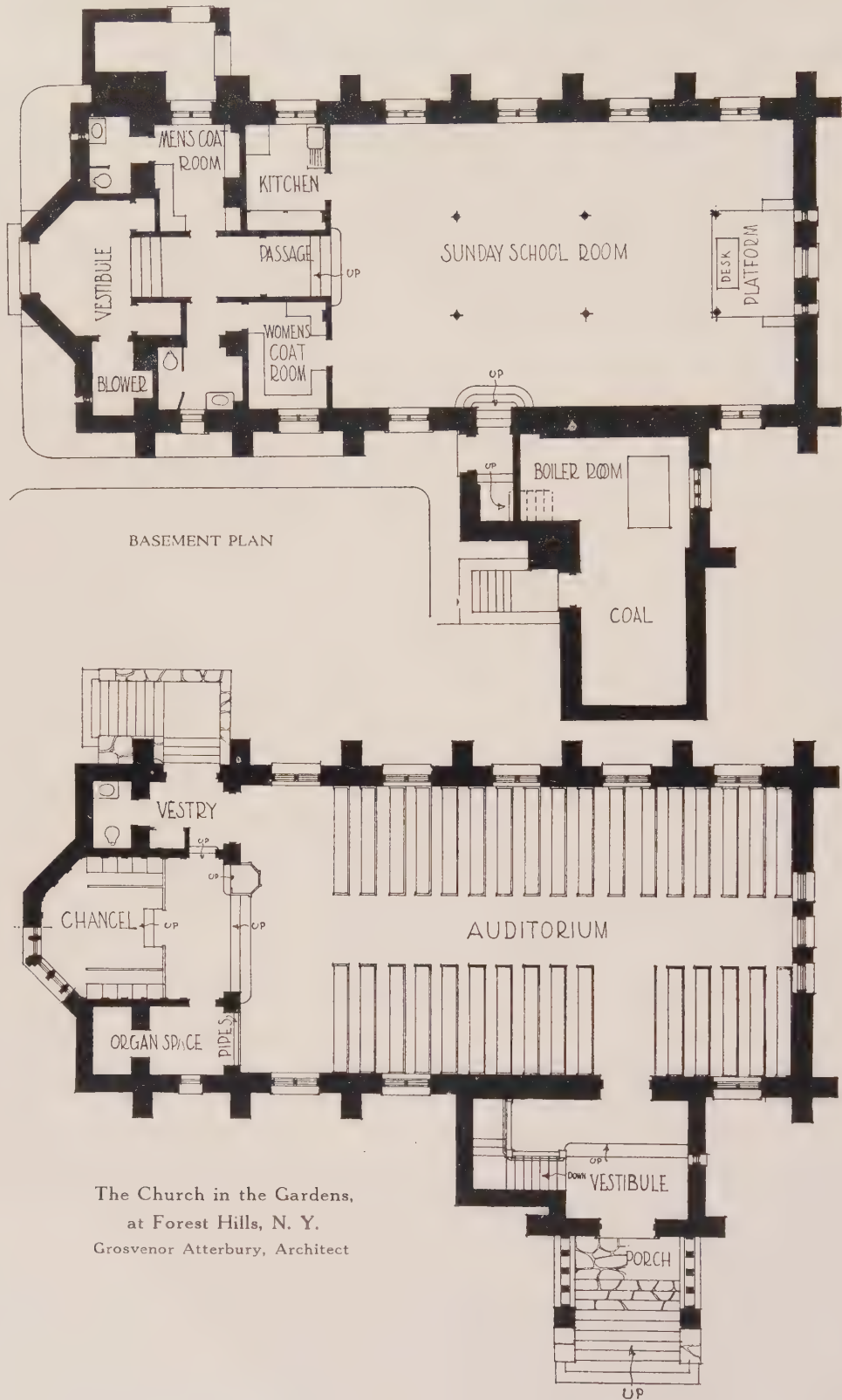
Chelsea Presbyterian Church and Cartaret Apartment Hotel, New York City

Emery Roth, Architect



Bethesda Church at Palm Beach, Florida
Hiss & Weekes, Architects

THE PRACTICAL REQUIREMENTS



The Church in the Gardens,
at Forest Hills, N. Y.
Grosvenor Atterbury, Architect

Dr. Lee's death which delayed the carrying out of the idea until the present time.

But it has been found that in some cases the same end can be achieved by building an apartment house on one part of the property as a separate building to produce the revenue and building the church on another part of the property as a separate compact unit. This was done by Henry C. Pelton in the case of a church society that at first contemplated building a combination structure. In this particular case a careful study of the problem showed that it would be advantageous to keep these buildings separate, and this was done.

The requirements for a Catholic Church are well established and not subject to the same changes as those for other churches. An admirable example of a Roman Catholic Church of moderate size so planned as to meet all of the practical requirements and to have the necessary religious attributes is the Church of the Holy Innocents, Brooklyn, New York City, Helmle and Corbett, architects, drawings of which are reproduced on pages 76 through 83. The practical requirements are clearly indicated by a study of these drawings.

A Christian Science Church requires a good auditorium in which everyone can hear and see clearly, and aside from this all that is required is a spacious, dignified entrance lobby, certain minor conveniences and the proper spaces for the heating and ventilating plant, etc. There are no

social rooms connected with a Christian Science Church. The Sunday school is separate, usually in a separate building. The church must be dignified and simple throughout. There is no prescribed style of design and no characteristic symbolism enters into the design. No symbolic designs of any kind are used either on the exterior or the interior, and only certain quotations from Mrs. Eddy's book, "Science and Health," are permitted to be used on the walls. A rather massive classic type of architecture has been most often employed for Christian Science Churches in the past, but there is a marked tendency to depart from this treatment which was almost becoming a tradition. Recent Christian Science Churches show a wide range of designs, including some charming buildings of moderate size that have as their prototype the small English country church. This type of church fits into its surroundings especially well in suburban and rural localities.

The Third Church of Christ, Scientist, New York, Delano & Aldrich, architects, is a good example of an important city church that meets the practical requirements and has suitable design character.

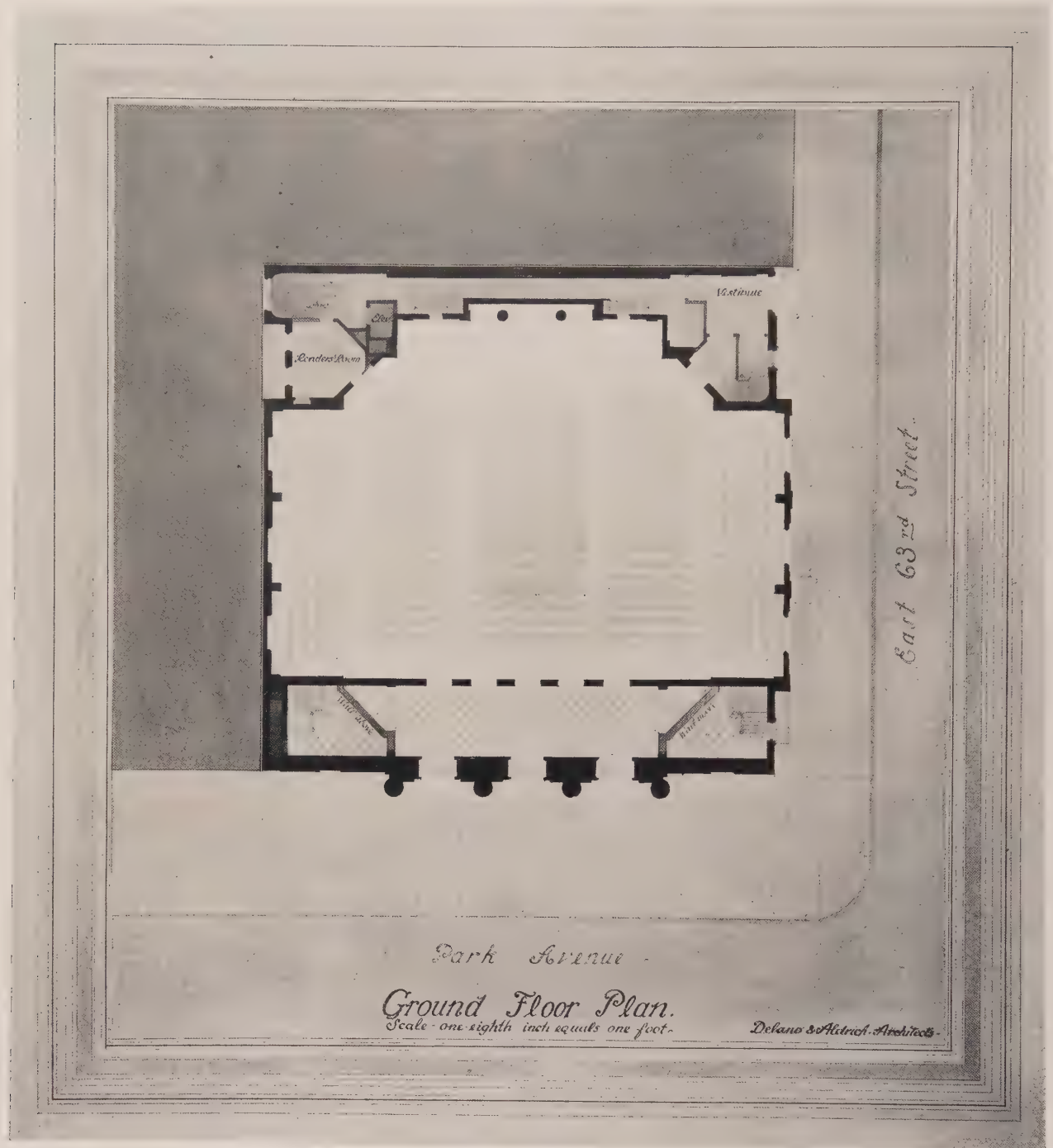
A type of church plan that is the direct opposite of the plan of the Park Avenue Baptist Church is that of the Bethesda Church, at Palm Beach, Florida, Hiss & Weekes, architects.

The Bethesda Church and its dependencies are



The Church in the Gardens, at Forest Hills, N. Y.

Grosvenor Atterbury, Architect

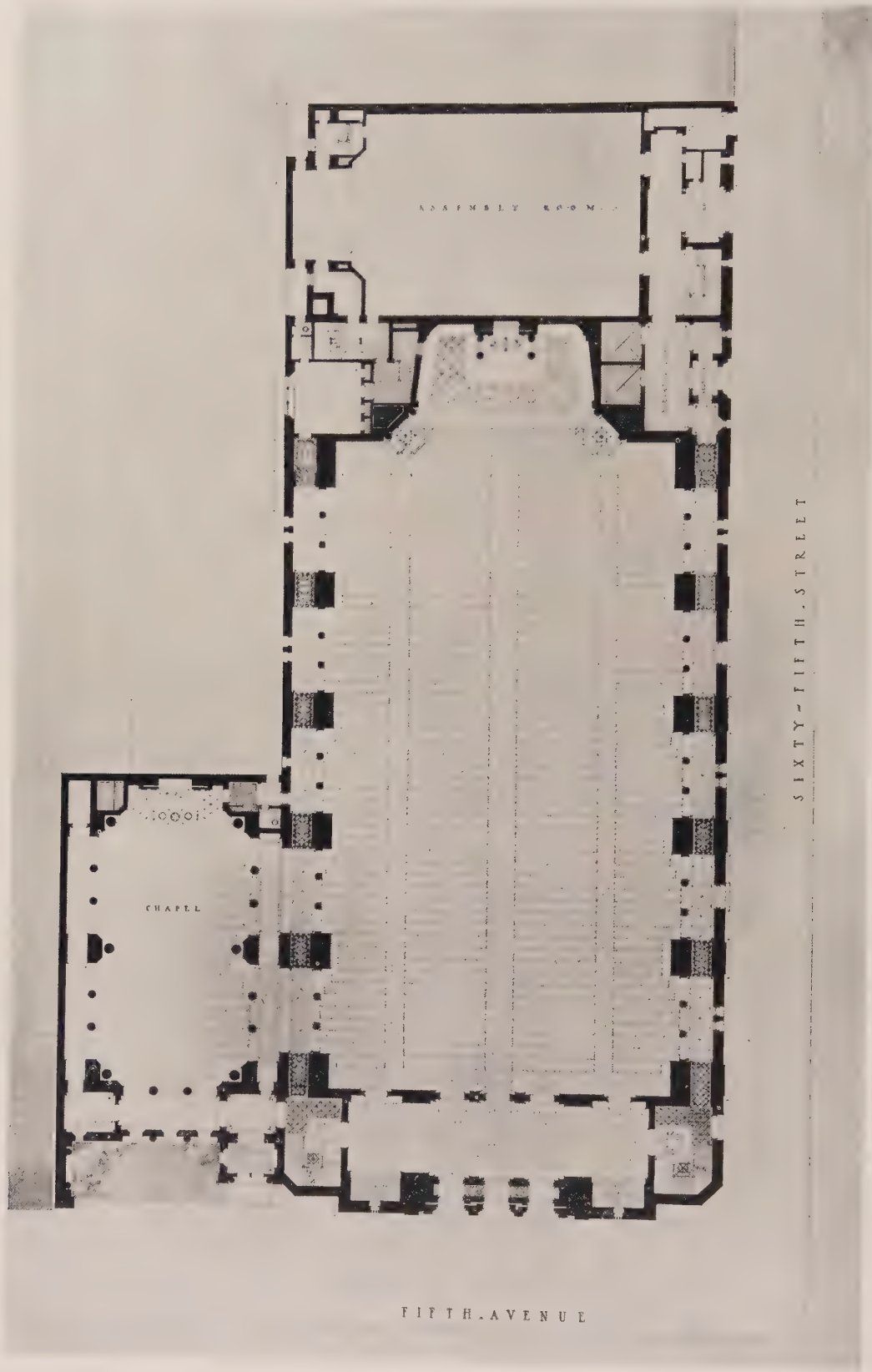


Third Church of Christ, Scientist, Ground Floor Plan, New York City
Delano & Aldrich, Architects



Third Church of Christ, Scientist, Elevation on Park Avenue, New York City
Delano & Aldrich, Architects

THE PRACTICAL REQUIREMENTS



Plan of Main Floor, Temple Emanu-El, Fifth Avenue and Sixty-fifth Street, New York City

Robert D. Kohn, Charles Butler and Clarence S. Stein, Architects Associated.

Mayers, Murray & Phillip (Goodhue Associates), Consultants



Temple Emanu-El, New York City

Robert D. Kohn, Charles Butler and Clarence S. Stein, Architects Associated.
Mayers, Murray & Phillip (Goodhue Associates), Consultants

grouped around three sides of a cloister garth. At the south side of the garth is the church with its nave, transept, choir and chancel. This is an Episcopal Church. The sacristy and the baptistry adjoin the chancel and the transept respectively. Along the east side of the garth are the choir room and the guild room, while at the northeast corner is the study. Along the north side of the garth is the rectory, the cloister serving to shade the windows of the ground story. The second floor of the rectory extends over the north cloister.

Entrance to the cloister garth is had through the center of the west cloister and the garth may be used for open air services. There is an outdoor pulpit in the corner of the garth next to the church.

The main practical requirements of ritualistic churches and nonritualistic churches do not differ so

widely today in respect to the type of floor, seating and pulpit as they did a few years ago when it was the custom of many ministers of nonritualistic Protestant churches to speak from a platform and not to remain at the desk but to move about while delivering their discourses.

That necessitated the bowled floor, sloping from all parts of the auditorium towards the platform, in order that everyone might have a good view of the speaker. Then, too, that was a time when certain Protestant denominations seem to have regarded religious service as of little importance in comparison with the sermon, which had become in many cases a lecture on popular topics of current interest. That the churches of those congregations assumed more of the characteristics of the lecture hall and the theatre than of the traditional church is not surprising. But the bowled floor, the radiating



Study for Sinai Temple,
Mt. Vernon, N. Y.

Tachau & Vought, Architects



The Ark, Mikveh Israel Synagogue,
Philadelphia, Pa.

Tachau & Vought, Architects

aisles, the curved seats with their "gooseneck" pew ends have passed out of favor and the regular thing in nonritualistic as well as ritualistic churches is the level floor with straight seats that have pew ends of dignified rectilinear outline.

There has been a return to the traditions of church architecture that has brought these denominations, in general, into line with the more conservative branches of Protestantism and has made a great improvement in church interiors throughout the country. At the same time the exterior of the church of moderate or small size has assumed greater dignity through the abandonment of the practice of designing churches that look like small models of big buildings, but rather to keep them reasonably big in scale, however small they may be. The simpler, more robust expressions of Gothic have come to be largely used and the delightful old Colonial

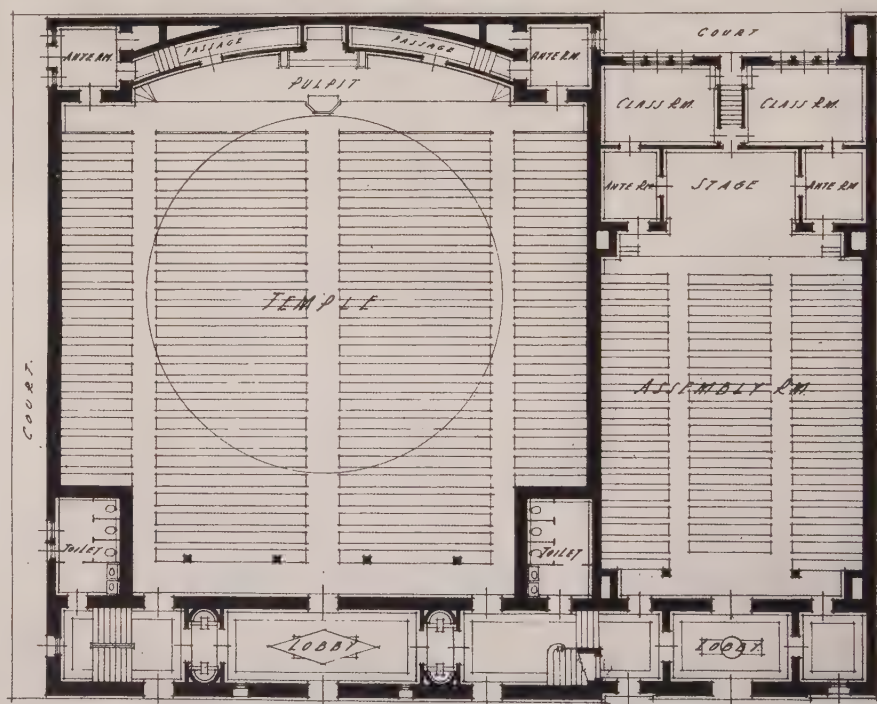
meetinghouse type has come into greater favor.

In the building of synagogues, developments have taken place during the past decade or so that have placed these structures in the first rank of modern religious buildings.

While the most striking development has, naturally, taken place in the synagogues other than those of Orthodox congregations, improved planning is in evidence everywhere.

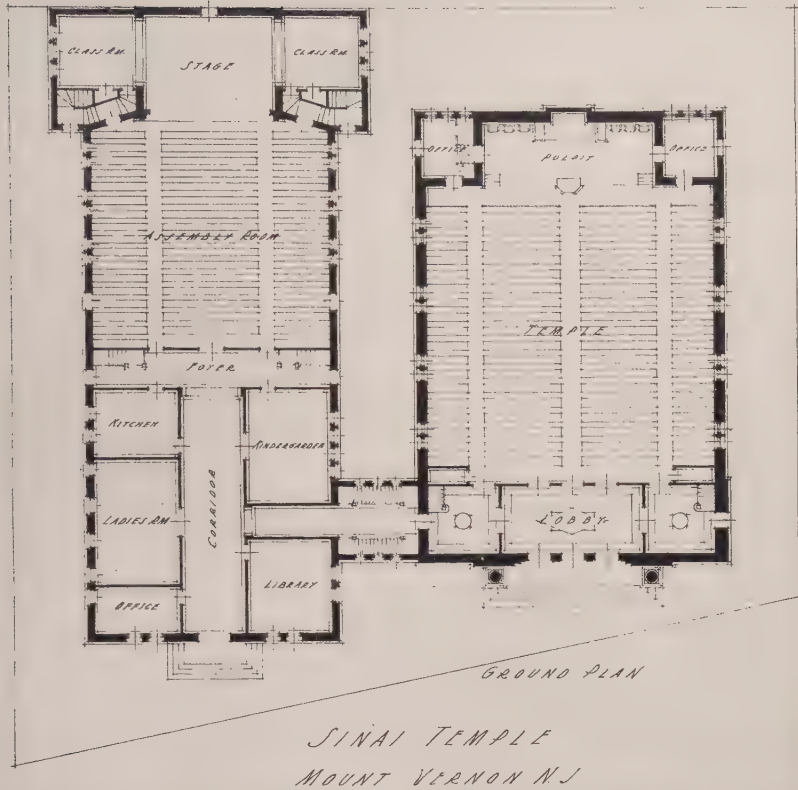
One of the most interesting of the newer buildings is Mikveh Israel Synagogue, Philadelphia, Pa., of which Tachau & Vought were the architects. Here the old idea of placing the women's section in a high gallery has been abandoned and the women are accommodated in sections extending along either side of the auditorium and raised only a few steps above the level of the central portion of the floor upon which the seats for the men are placed.

The women gain access to these sections easily from the wide vestibule that extends across the front of the building and is used by men and women alike. This feature of the plan does away with the hardship of stair climbing that was imposed upon the women for so long a time by the practice of assigning to their use the side galleries of the Basilica type of synagogue. This new placing satisfies every religious requirement and at the same time makes for greater comfort and convenience. It is in principle a return to the



Temple Israel, New York City

Tachau & Vought, Architects



Sinai Temple, Mt. Vernon, N. Y.

Tachau & Vought, Architects

practice, perhaps the oldest, of having the women's section in a separate room on the main floor level. The advantage of the new plan over that practice lies in the fact that in these slightly raised boxes the women can hear and see perfectly.

This placing can be seen in the plan of Mikveh Israel Synagogue which is printed herewith in conjunction with the plans of Gratz and Dropsie Colleges. The women's sections are divided from those of the men by the thin double lines, on this drawing, extending from front to rear of the main room. This plan shows also the traditional arrangement of the central features of the hall of worship, the reading desk being placed opposite to the Ark, not in front of the Ark as in Reform synagogues.

One of the latest and finest of the numerous synagogues recently built or now under construction is the new Temple Emanu-El at Fifth Avenue and Sixty-fifth Street, New York City, Robert D. Kohn, Charles Butler and Clarence S. Stein, architects associated, Mayers, Murray and Phillip (Goodhue Associates), consultants. The cost of this building is estimated at nearly two million dollars. The plan of the main floor and a perspective drawing of the new Temple Emanu-El are shown on pages 64 and 65.

It is an example of the strong tendency to return to the Basilica type of design in the case of very large and costly synagogues, in preference

to the Byzantine type that has become so highly developed during recent years.

There is no inconsistency in this, so far as religious traditions are concerned, for Roman Basilicas were used as synagogues earlier than they were used as Christian churches.

This form makes it possible to give to the synagogue the religious atmosphere, the air of dignity and solemnity that it is difficult to obtain, to the same degree, in buildings on the Greek cross plan.

The practical considerations of good daylight, a clear view of the Ark and the perfect hearing for everyone in the congregation have been paramount in the designing of most large synagogues in recent years. The Greek cross plan and its variants afford better opportunities to meet these requirements than does the relatively long and narrow Basilica type of plan.

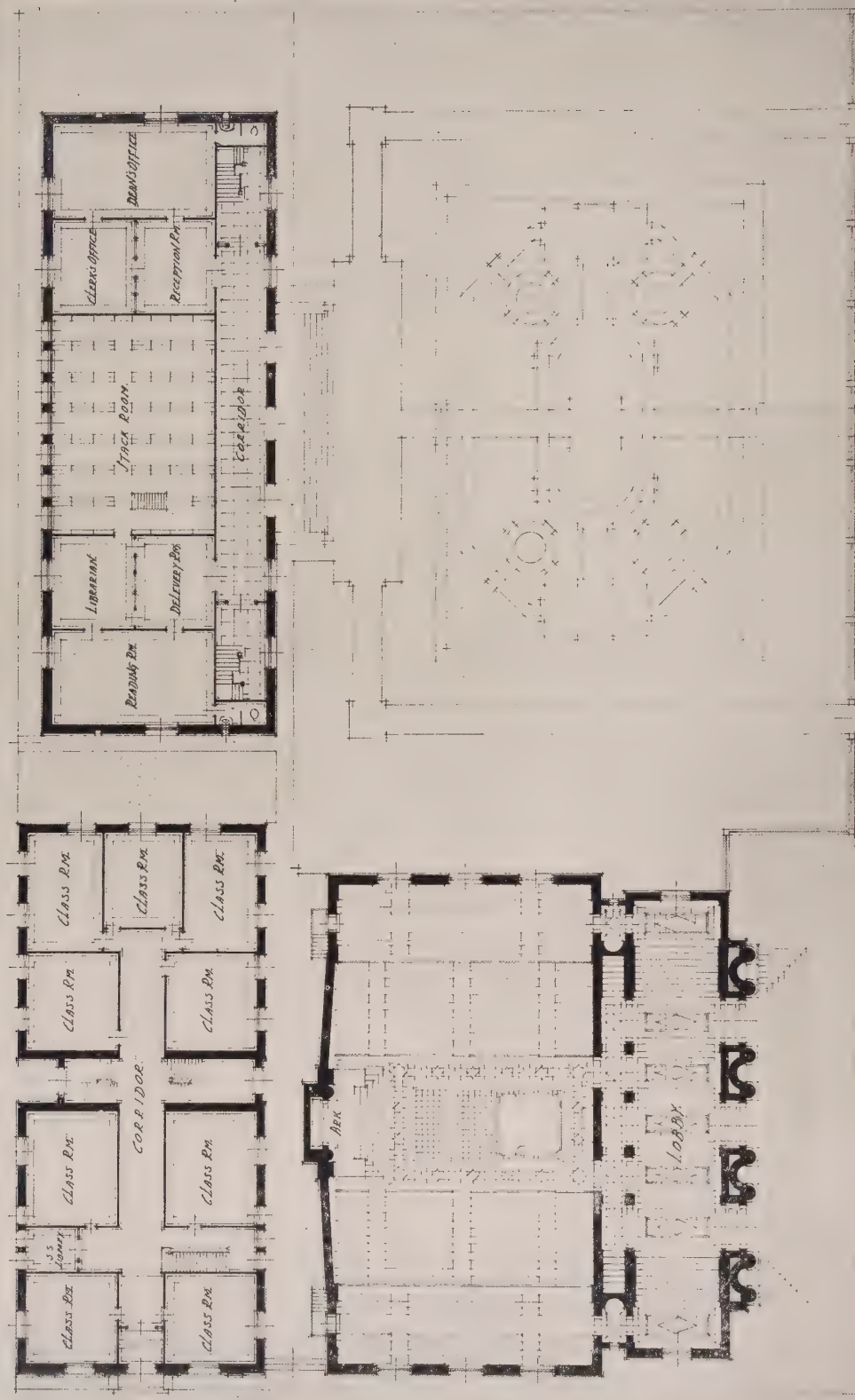
The synagogues of Reform congregations, like the churches of nonritualistic Protestant congregations, have often had much of the lecture hall quality, owing to a desire to enable people to hear and see well from every seat in the building. Now there are many signs of an appreciation of the value of a religious



Temple Israel, New York City

Tachau & Vought, Architects

THE PRACTICAL REQUIREMENTS



Plan of Mikveh Israel Synagogue and Gratz and Dropsie Colleges, Philadelphia, Pa.
Tachau & Vought, Architects



St. Gregory's Church, Brooklyn, N. Y.

Helmle & Corbett, Architects

atmosphere and of dignified and impressive architecture on the part of both of these groups.

The Byzantine type is not naturally deficient either in dignity or in architectural worth but the choice of this style in most cases seems to have come about through the gradual approach to a square plan in an effort to bring the seats as near the Ark as possible and to provide as clear a view as could be obtained. As a result the heavy masonry piers, or piers that simulate heavy masonry, forming so impressive a part of an interior in the Byzantine manner, have often been sacrificed. Some of the most impressive and beautiful synagogues in this country are in the Byzantine style or variants of this style. On page 58 is shown a small photograph of the admirably designed Temple Israel, Boston, Mass., C. H. Blackall, architect. Those congregations that had abandoned the ritual soon felt the desire to give everyone a view of the Ark and of the speaker. The long room of the Basilica type became shorter and broader, until all of the Basilica characteristics were lost and the room became practically square. It then acquired a bowled floor, in many instances, like that favored at about the same date for nonritualistic churches.

During the past ten years or so there has been a tendency to concentrate upon the Byzantine, or Greek cross type, and as a result many variants

have developed and many beautiful and practical domed synagogues have been built.

So far as appropriateness of style for a synagogue is concerned it is well to remember that the time-honored practice has been to build the synagogue in whatever style of architecture was current at the time for other buildings in the country or section. For instances, there are Moorish synagogues in Spain, Gothic synagogues in Germany and there were synagogues in America in Colonial times that looked like the meetinghouses of the day.

The importance of a realization of the fact that the synagogue is not restricted to the use of any one or two architectural styles by either tradition or a sense of appropriateness lies in the greater latitude this realization gives the architect in the choice of a plan to meet the practical requirements of each case and to make his building fit into the surroundings.

In many of our cities a type of design broadly described as Classic is much favored. It harmonizes well with the surrounding residences and apartment houses usually. Unfortunately, it often has more of the qualities of the speculative apartment house than of the architectural worth and dignity that are suitable to a house of worship. But that is not a fault of the Classic type of design for synagogues, but of the way in which this style



Nave Looking Towards Altar, St. Gregory's Church, Brooklyn, N. Y.
Helmle & Corbett, Architects

is interpreted, probably by apartment house architects.

In suburban locations and the smaller towns, as well as in the more open parts of cities, the Colonial meetinghouse type is often the best choice.

There is a strong feeling on the part of some congregations, however, that a synagogue does not look like a synagogue unless it has something of the architecture of the East about it. For this reason, Byzantine is often the best choice. That this style need not be confined to the very large buildings, but that a synagogue of moderate size in this manner can be so designed that it has dignity and satisfactorily large scale is shown by the study for the front of Sinai Temple, Mt. Vernon, N. Y., Tachau & Vought, architects, which is reproduced at small size on page 65.

On page 66 is shown a photographic view of the Ark in Mikveh Israel Synagogue, Philadelphia, representative of the traditional type of Ark, the reading desk being placed opposite, near the other end of the room. On page 67 is a photographic view of a portion of the interior of Temple Israel, New York City, showing the arrangement found in Reform synagogues, the reading desk being placed directly in front of the Ark.

Plans of two synagogues for nonritualistic service are shown here, on page 67 the plan of Sinai Temple, Mount Vernon, N. Y., and on page 66, the plan of Temple Israel, New York City, both by Tachau & Vought, architects.

It will be noted that the auditorium, in the case of both of these buildings, is relatively square, in order that everyone may hear and see clearly—seeing the speaker clearly, for some reason, is an aid to hearing or at least to the understanding and enjoyment of his discourse.

Adjoining these two synagogues are temple houses, shown on the same plans. The main feature of these temple houses is the auditorium that is used for the Sunday school and for the social activities of the congregation.

The temple house has become a very important feature in recent years. It may be built either directly beside the temple, as in the case of the Temple Israel, or somewhat separated, as in the case of the Sinai Temple shown on these pages. Sometimes, where land values are high, the temple and temple house are in the same building, the temple occupying the lower part, on the ground level, and the temple house being in the stories above. But there is a sense of greater respect for the temple, perhaps, when the temple house is made a separate, though adjoining, building. From the relatively simple accommodations shown in these two plans the provisions for social activities now range upwards to the most complete and splendidly equipped buildings.

A very fine example of the high degree of

development that the temple house has now reached is the Union Temple House on Eastern Parkway, Borough of Brooklyn, New York City, Gehron, Ross, and Alley, Architects (Arnold W. Brunner Associates).

Floor plans and sections of this building are shown on pages 84 through 97. It will be seen that the auditorium occupies the principal part of the ground floor and extends through the center of the second floor—see section on page 96. The second floor has a gallery across the back.

Pending the completion of the temple, which the temple house will directly adjoin, the auditorium of the temple house will be used for the services of the synagogue. Curtains have been hung at the back of the platform to form a background for the Ark. A reading desk and two menorah have been placed on the platform. These can be removed when it is desired to use the auditorium for purposes other than as a synagogue.

The third floor is devoted to the banquet and ballroom which extends through the fourth floor with a balcony all around at the fourth floor level.

Above the ballroom is a story given over to classrooms. These rooms are placed between the deep girders that are required to span the large rooms in the stories below. Circulation is secured in this story by means of doors for which openings have been left in the trusses, in the center of the building.

On the sixth floor is the swimming tank with locker rooms, etc. The seventh floor is at the level of the top of the swimming pool and is occupied by rest and massage rooms, and so on.

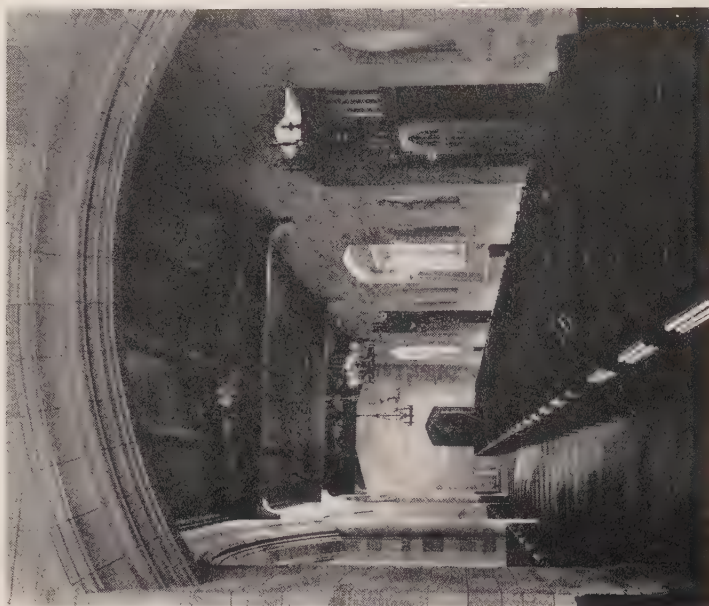
On the eighth floor is the gymnasium extending through the ninth floor. In the smaller structure above the main roof at the eleventh story level are two handball courts.

These plans and sections of the building are especially worthy of study since they embody detailed information concerning the practical requirements of a building for the social activities of a religious organization, which are very much the same whether that organization be a synagogue or a church.

For further reading the author recommends Wm. G. Tachau's treatise on "The Architecture of the Synagogue" in the American Jewish Year Book 5687, published by the Jewish Publication Society of America, Philadelphia, Pa. "The American Hebrew," published in New York City, makes a practice of publishing once a year, in the spring, one issue in which the synagogues built and those projected or under construction during the year are briefly described and many are illustrated. Such an annual review gives a good cross section of the current practice in the building of synagogues.



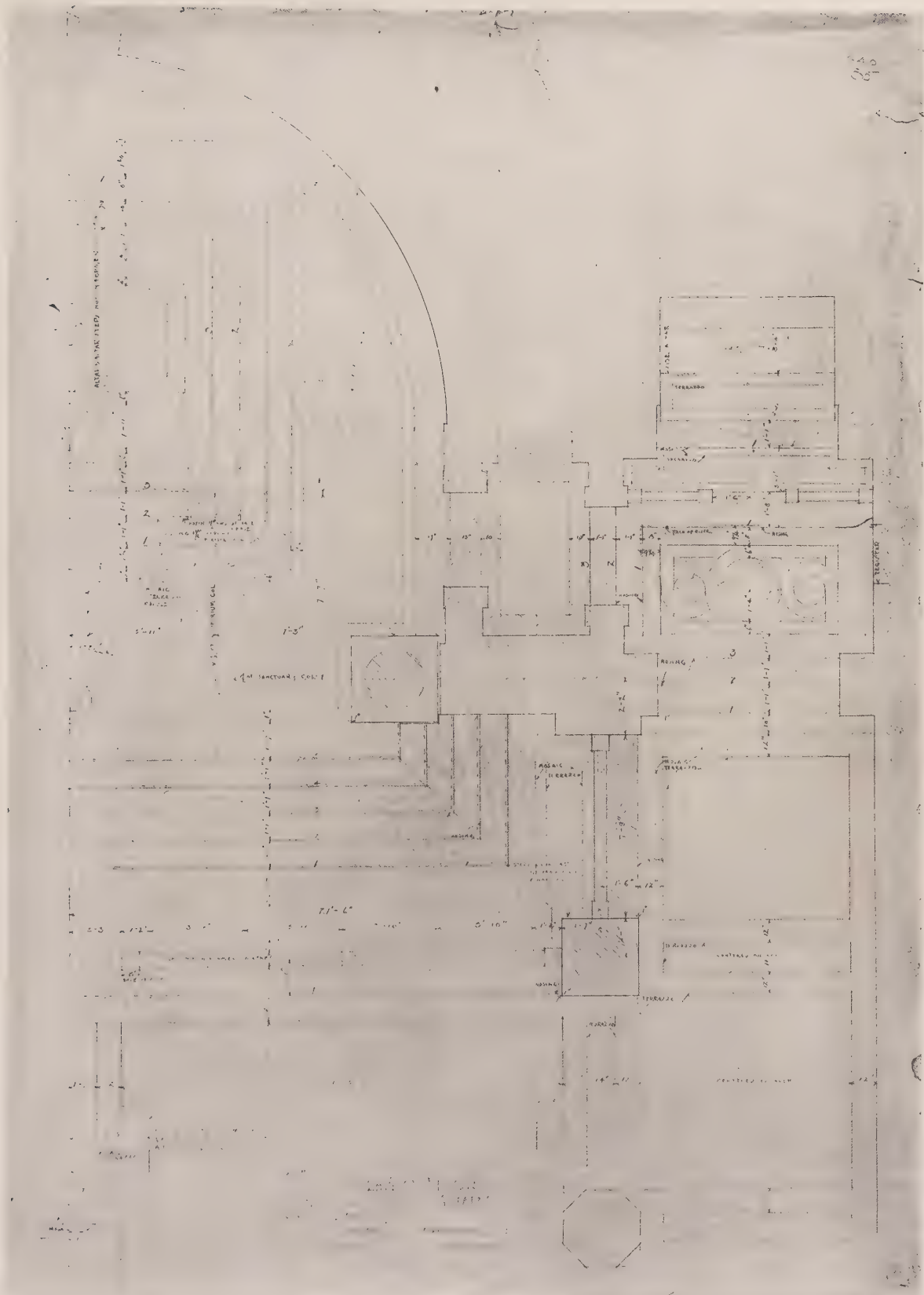
Transept



Side Aisle

Church of the Holy Innocents, Brooklyn, New York City
Helmle & Corbett, Architects

OF MODERN BUILDINGS

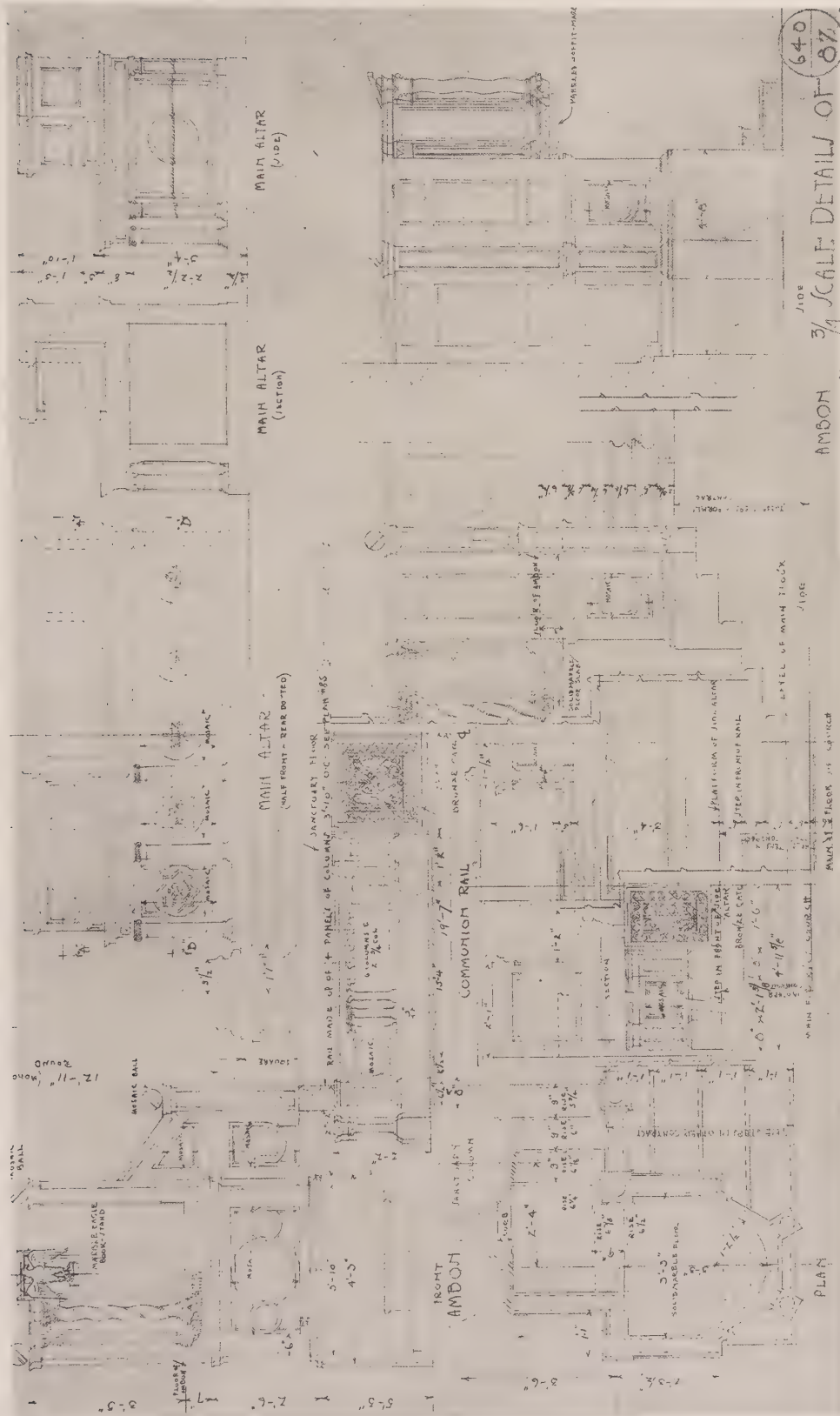


Plan Showing Location of Altars, Rails, Steps, Etc., St. Gregory's Church, Brooklyn, New York City
Helmle & Corbett, Architects

Scale Details of Main and Side Altars, Ambo, Rails and Ciborium, St. Gregory's Church, Brooklyn, New York City

Helmle & Corbett, Architects

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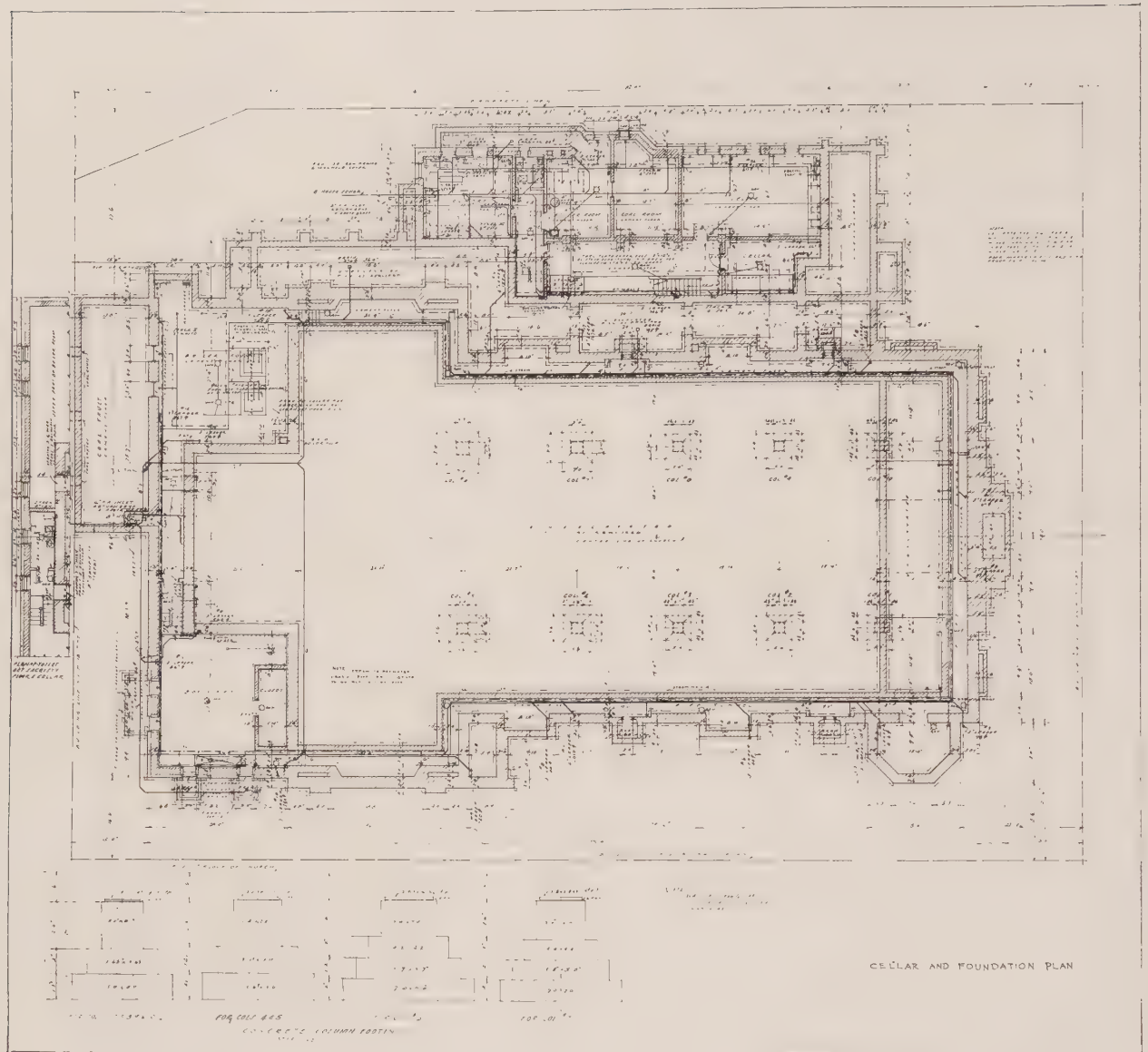


Scale Details of Main and Side Altars, Ambo, Rails and Ciborium, St. Gregory's Church, Brooklyn, New York City

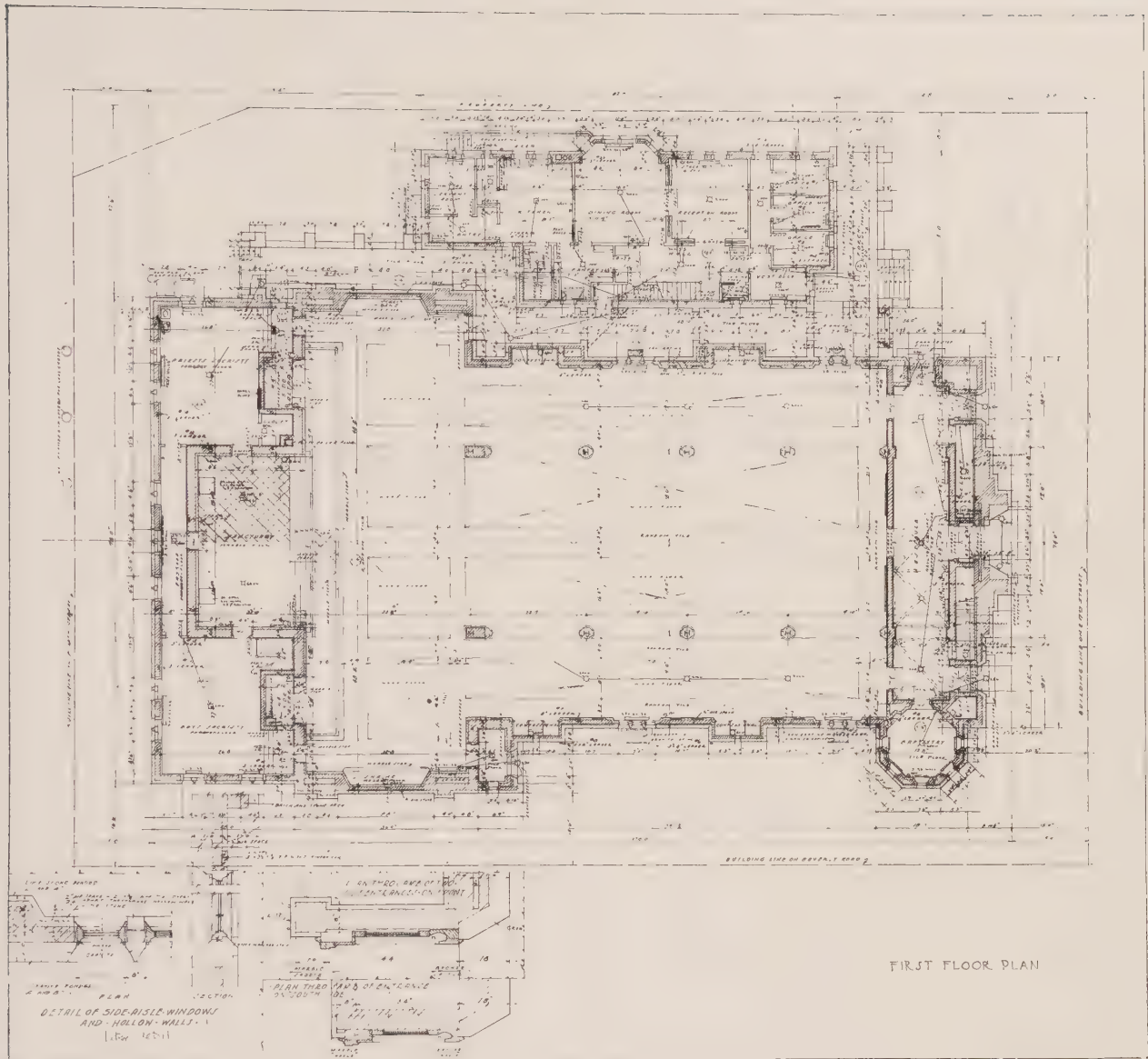
Helmle & Corbett, Architects

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THE PRACTICAL REQUIREMENTS



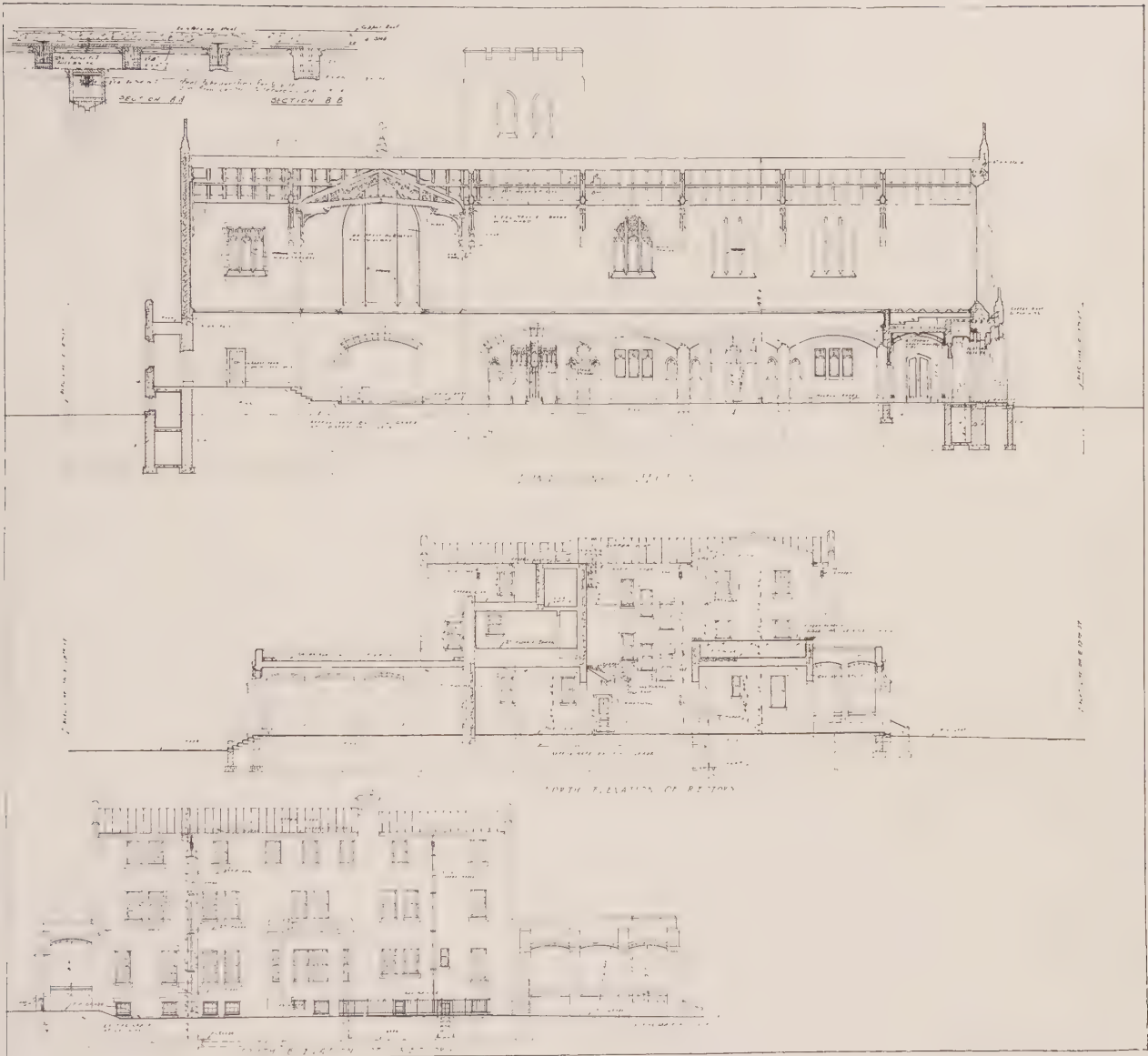
Foundation Plan, Church of the Holy Innocents, Brooklyn, N. Y.
Helmle & Corbett, Architects



Main Floor Plan, Church of the Holy Innocents, Brooklyn, N. Y.
Helmle & Corbett, Architects

CLERIC-STORY PLAN
2ND FLOOR PLAN OF RECTORY

75



Elevations, Church of the Holy Innocents, Brooklyn, N. Y.
Helmle & Corbett, Architects

THE PRACTICAL REQUIREMENTS



Elevations, Church of the Holy Innocents, Brooklyn, N. Y.
Helmle & Corbett, Architects

OF MODERN BUILDINGS

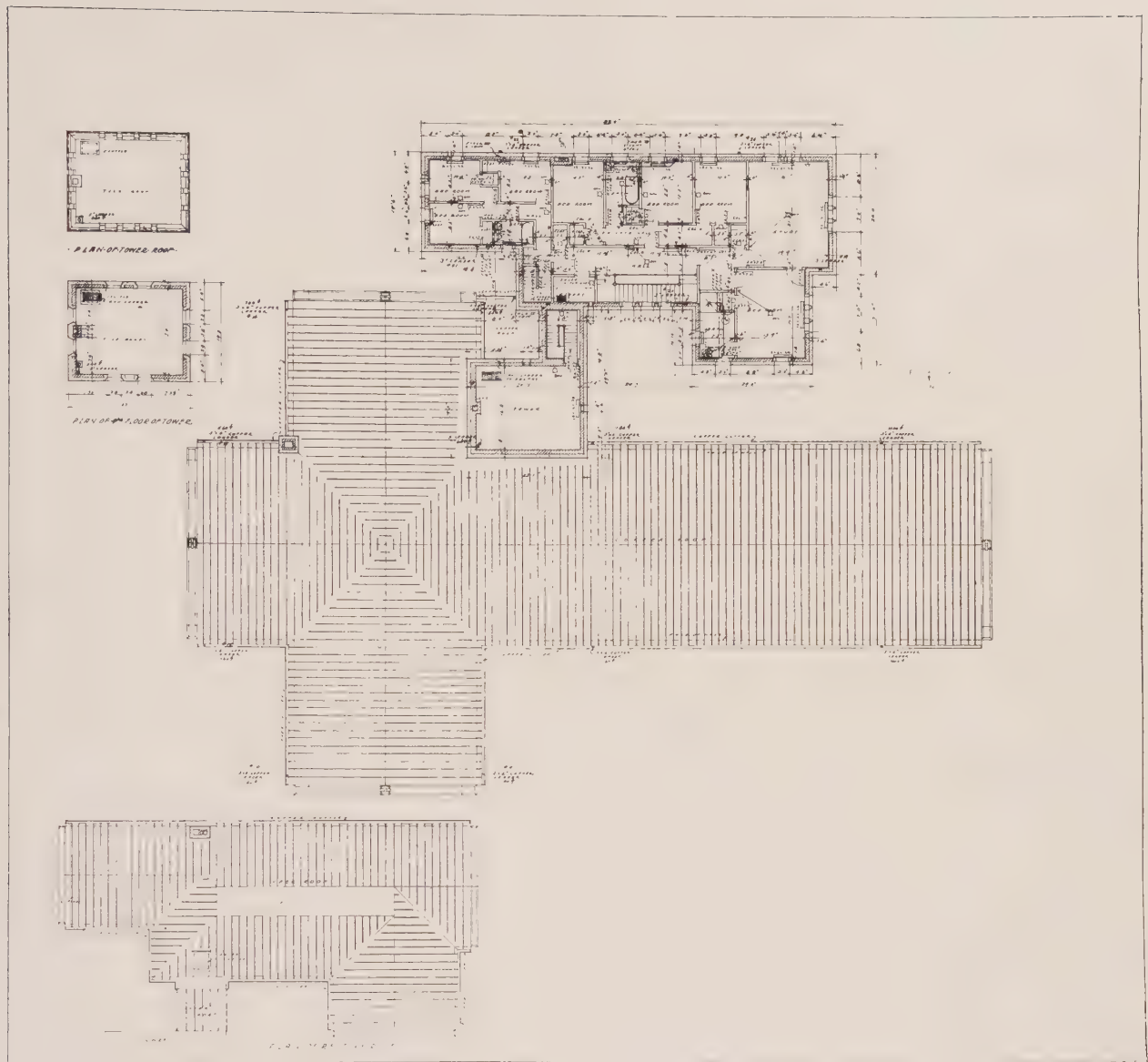


Sections, Church of the Holy Innocents, Brooklyn, N. Y.
Helmle & Corbett, Architects

THE PRACTICAL REQUIREMENTS

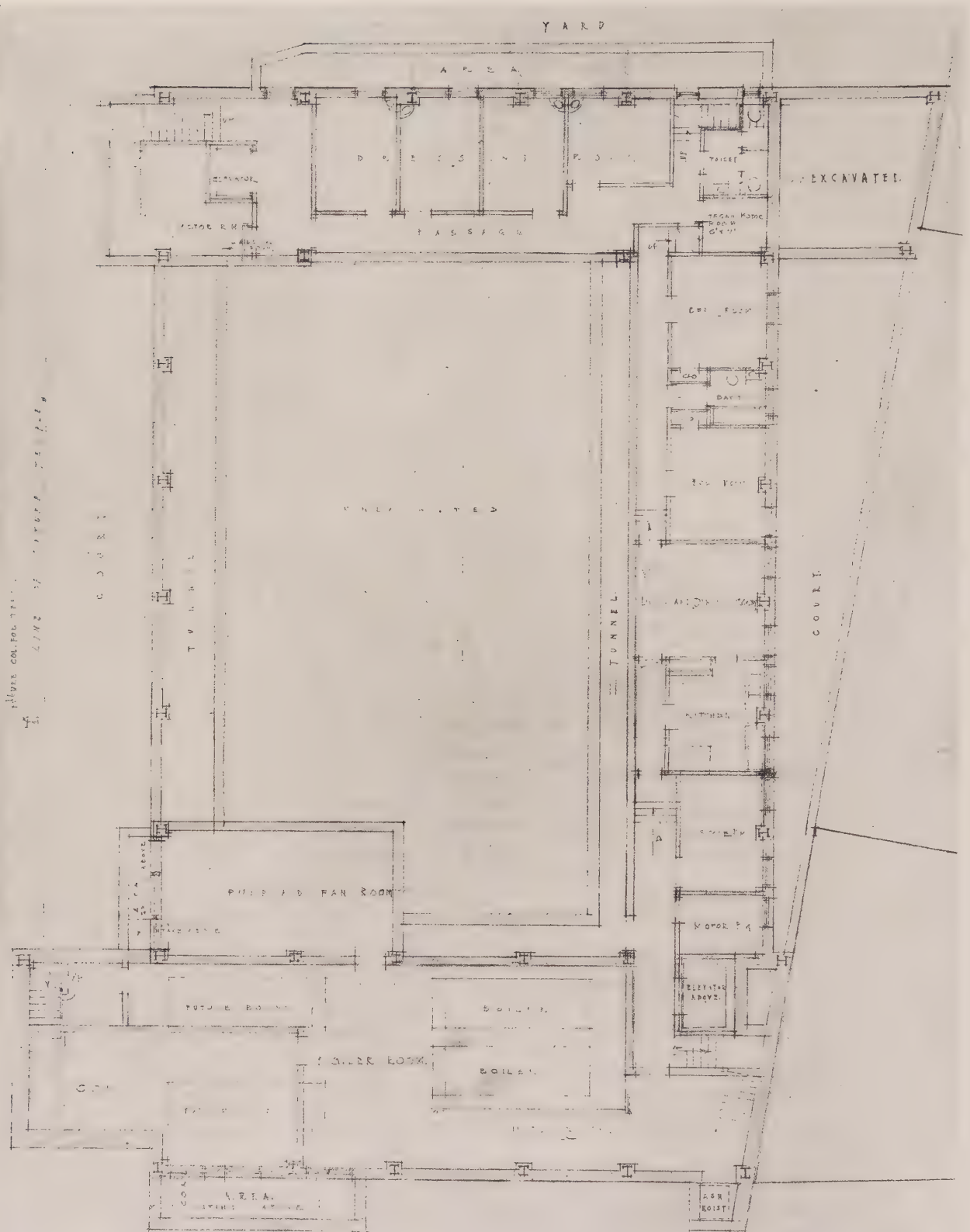


Elevations, Church of the Holy Innocents, Brooklyn, N. Y.
Helmle & Corbett, Architects



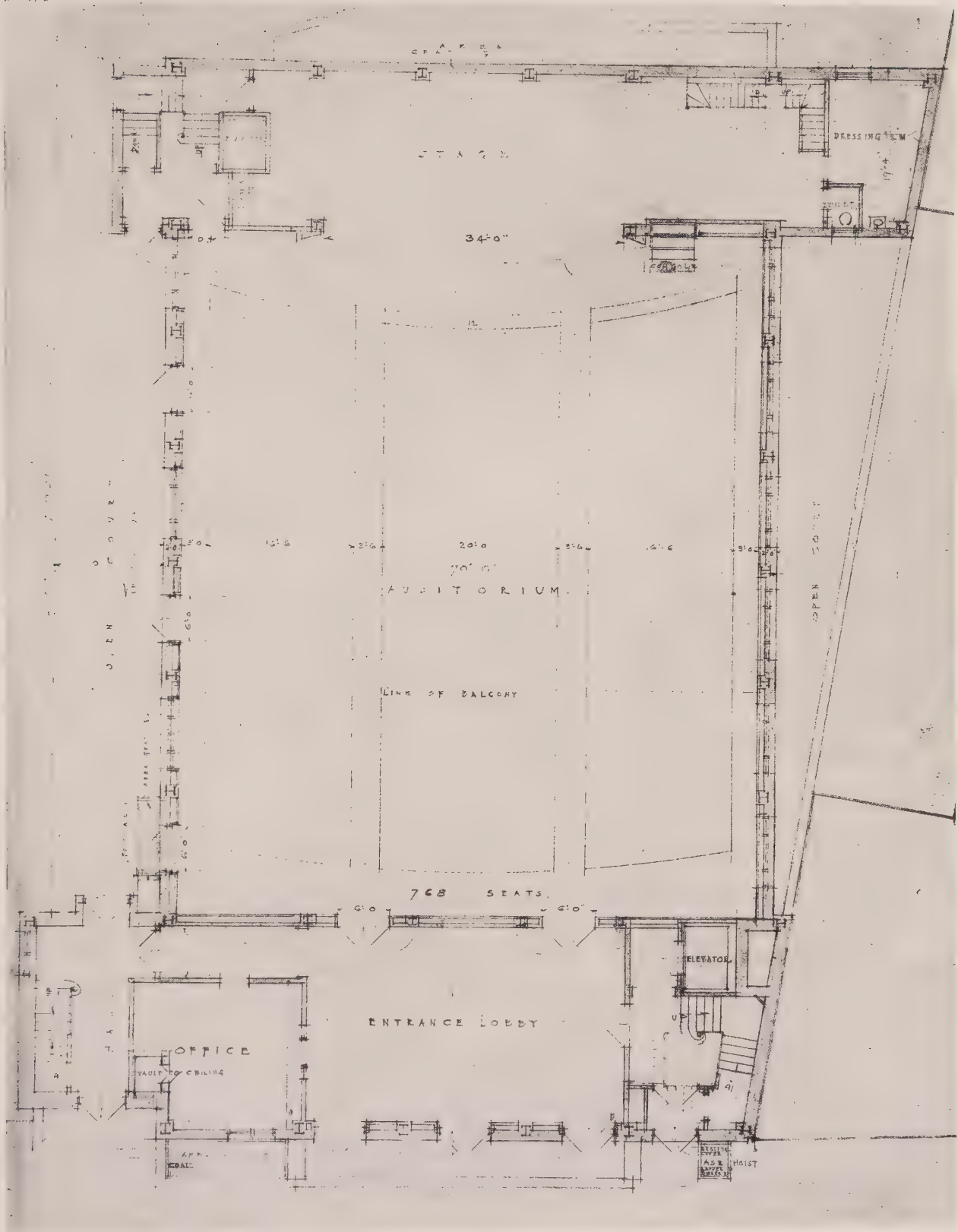
Roof Plan, Church of the Holy Innocents, Brooklyn, N. Y.
Helmle & Corbett, Architects

THE PRACTICAL REQUIREMENTS



Boiler Room Floor, Union Temple House, Brooklyn, N. Y.
Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

OF MODERN BUILDINGS



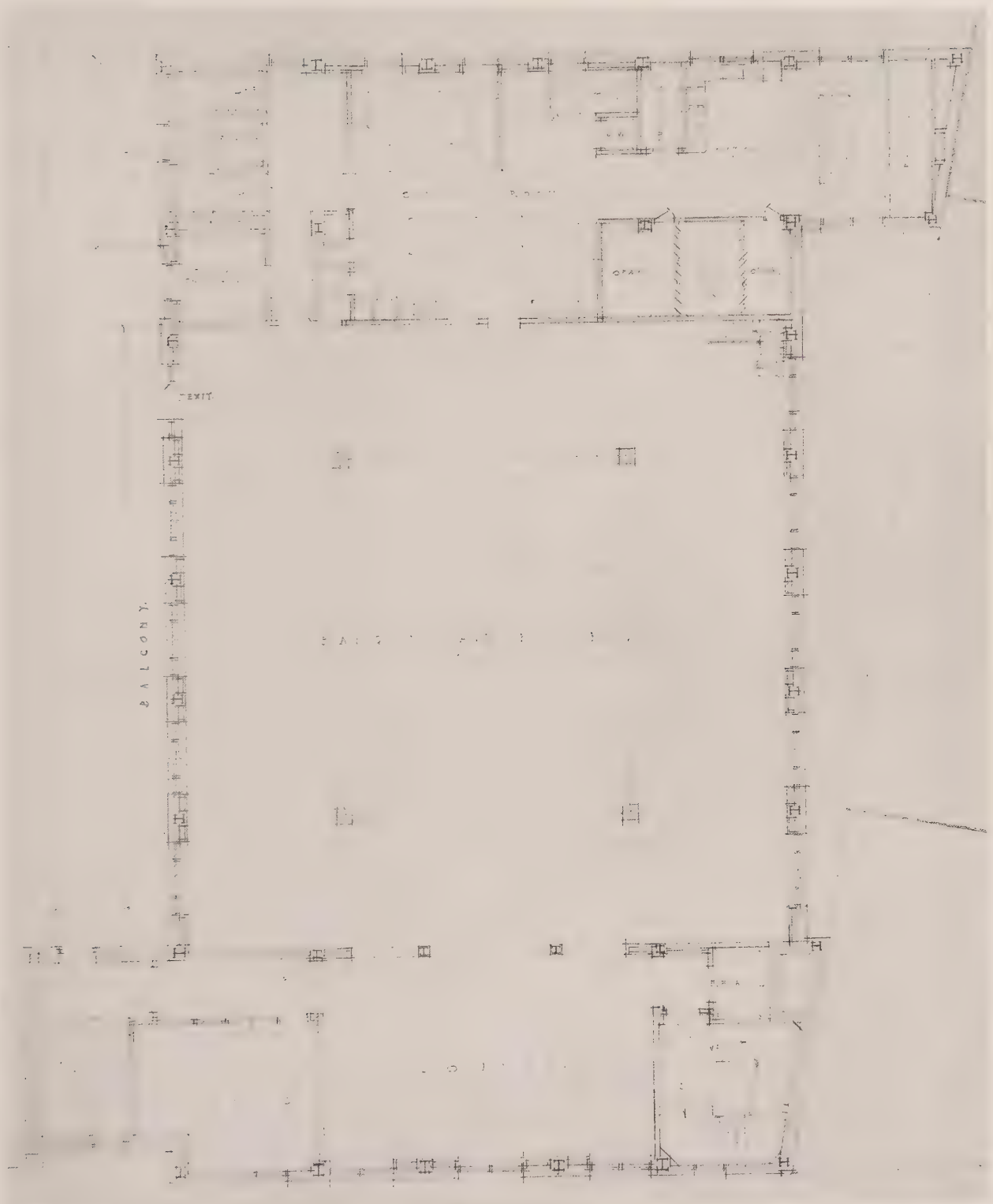
First Floor Plan, Union Temple House, Brooklyn, N. Y.
 Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

THE PRACTICAL REQUIREMENTS



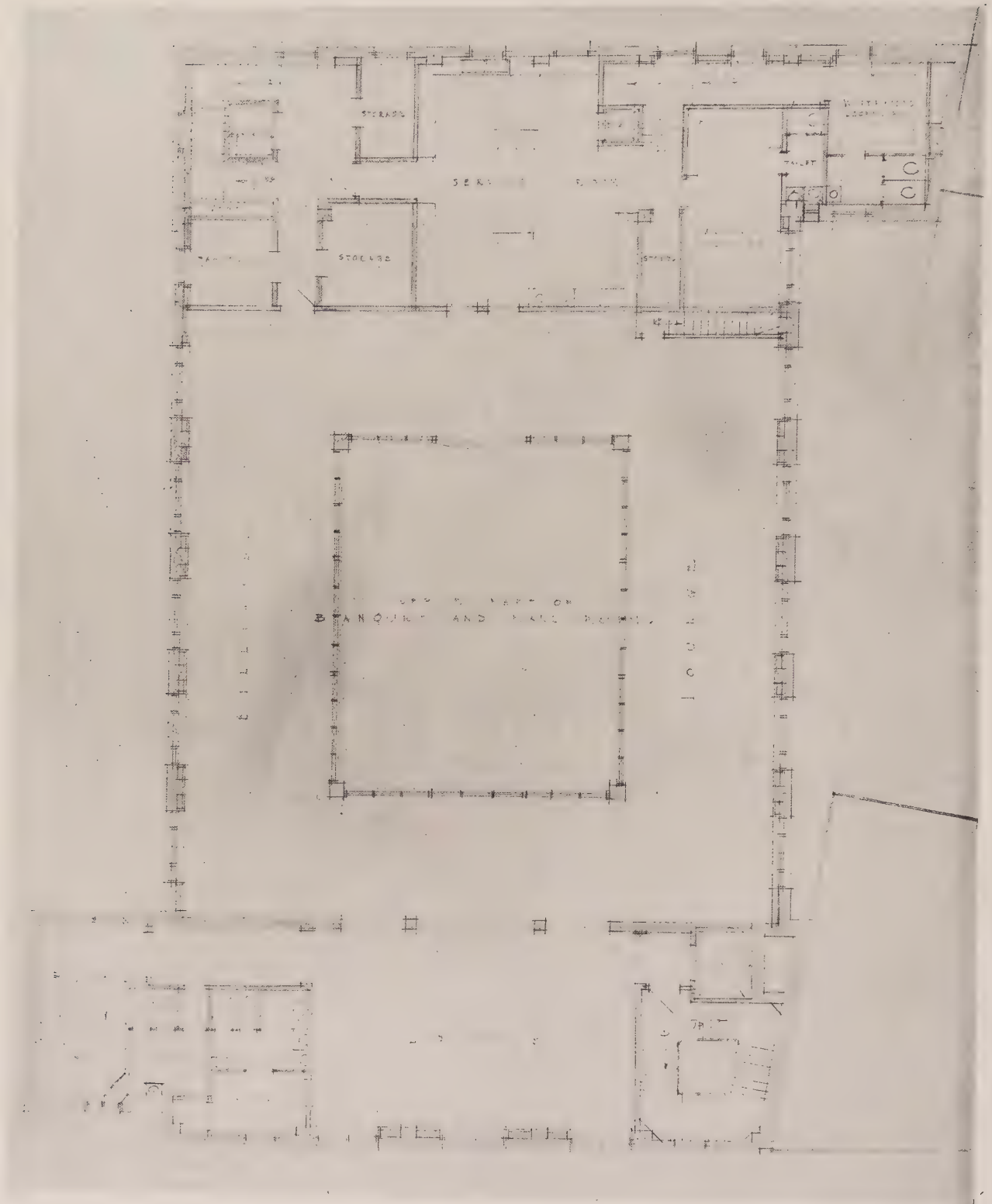
Second Floor Plan, Union Temple House, Brooklyn, N. Y.
 Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

OF MODERN BUILDINGS



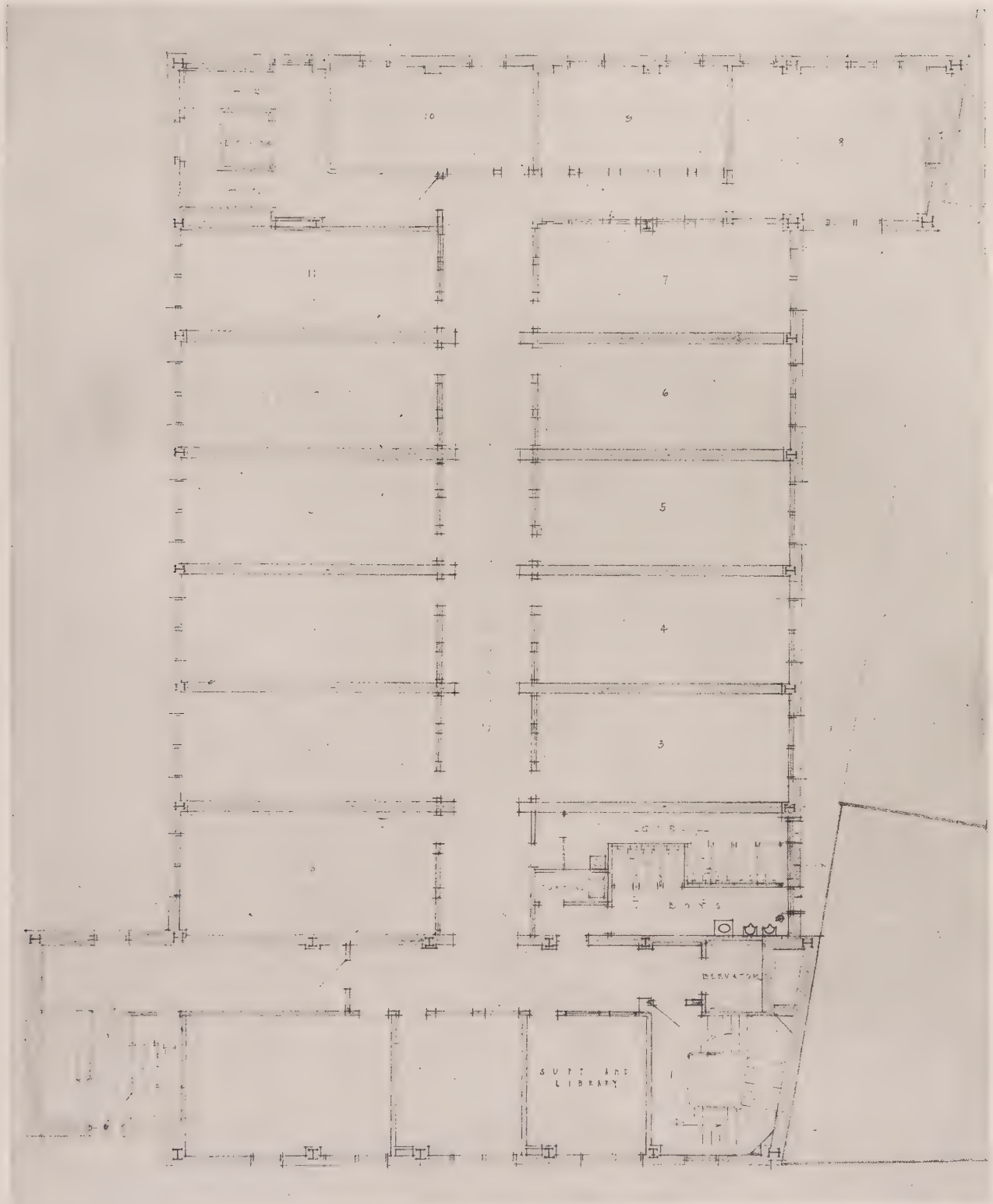
Third Floor Plan, Union Temple House, Brooklyn, N. Y.
Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

THE PRACTICAL REQUIREMENTS



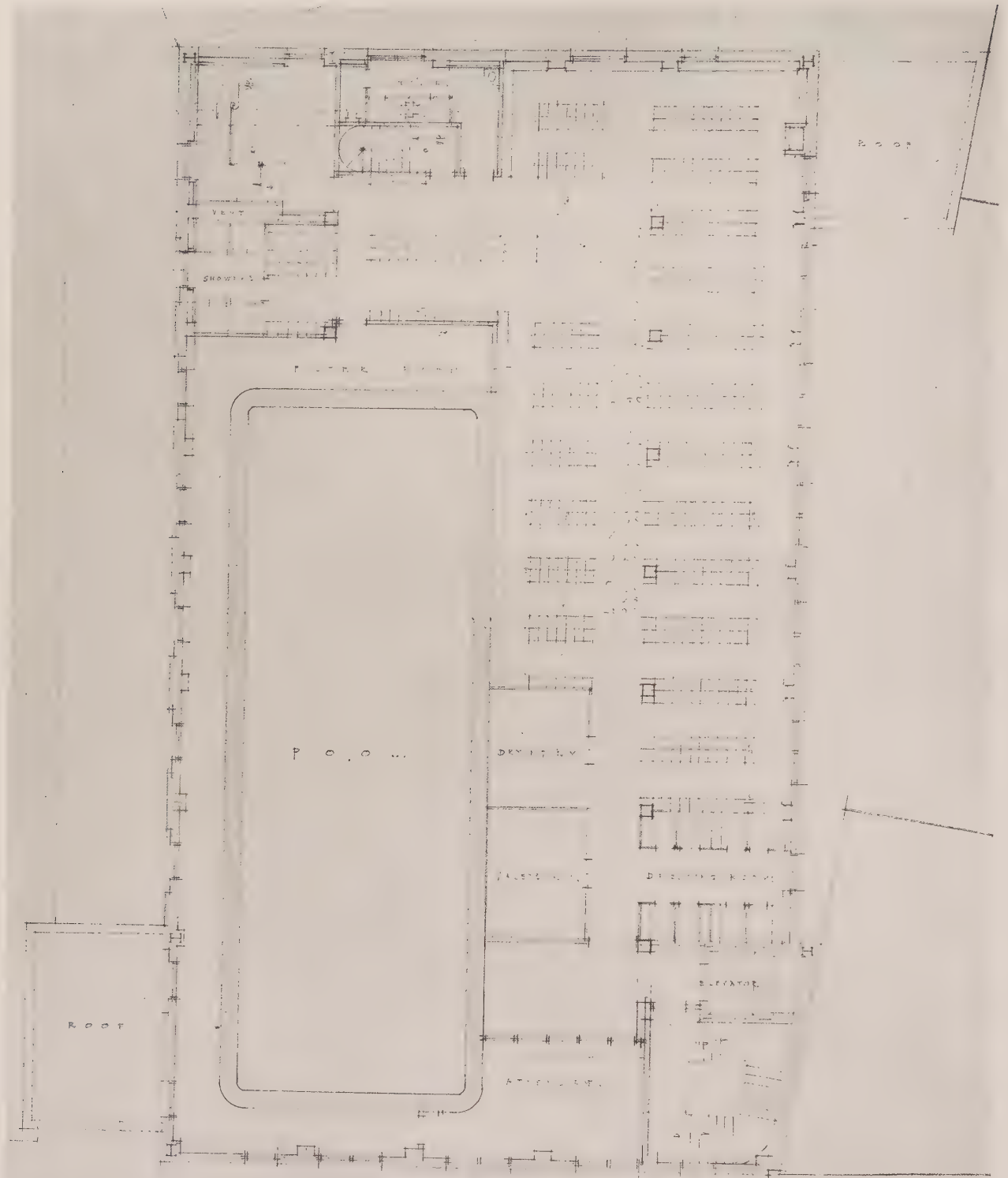
Fourth Floor Plan, Union Temple House, Brooklyn, N. Y.
Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

OF MODERN BUILDINGS



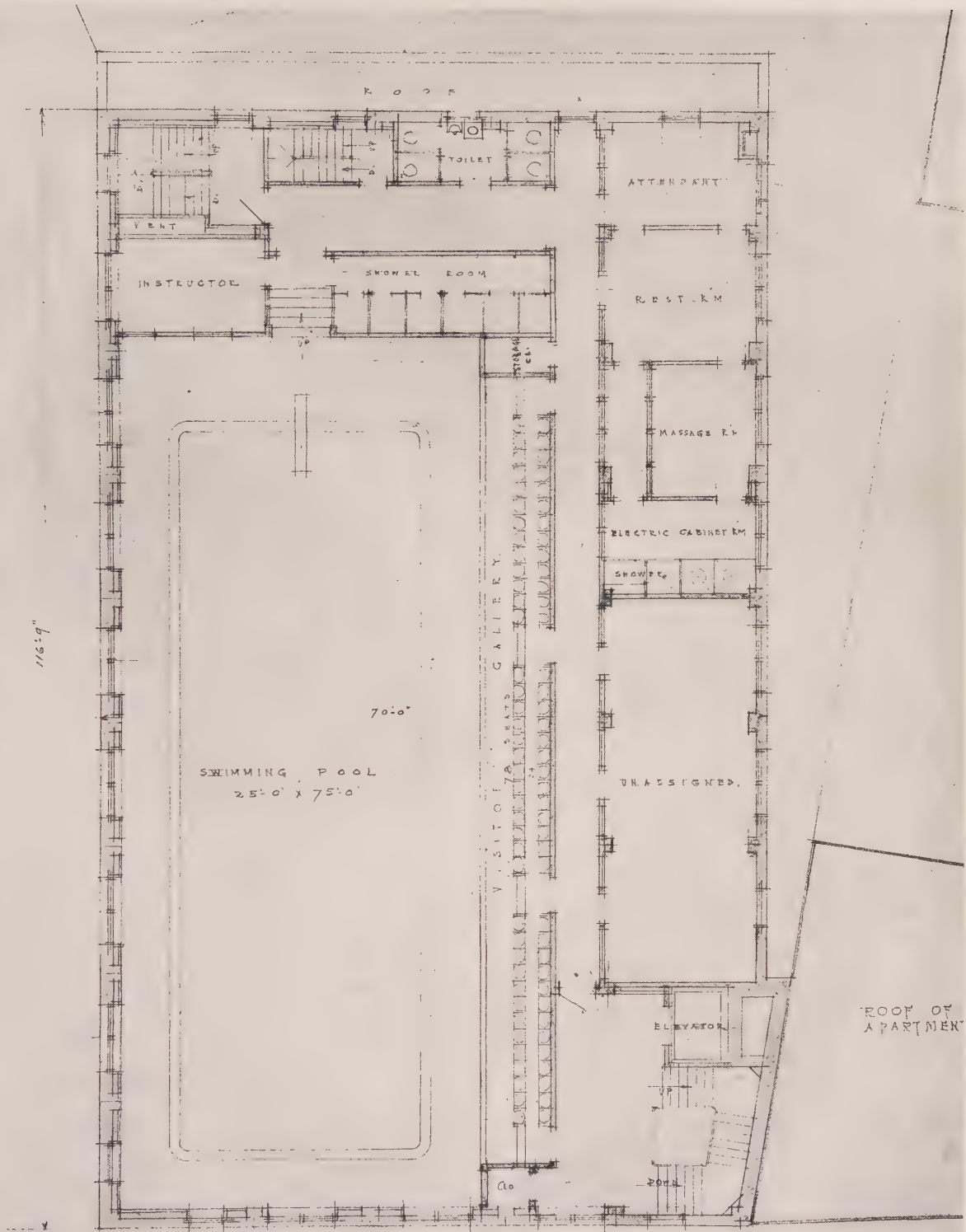
Fifth Floor Plan, Union Temple House, Brooklyn, N. Y.
Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

THE PRACTICAL REQUIREMENTS



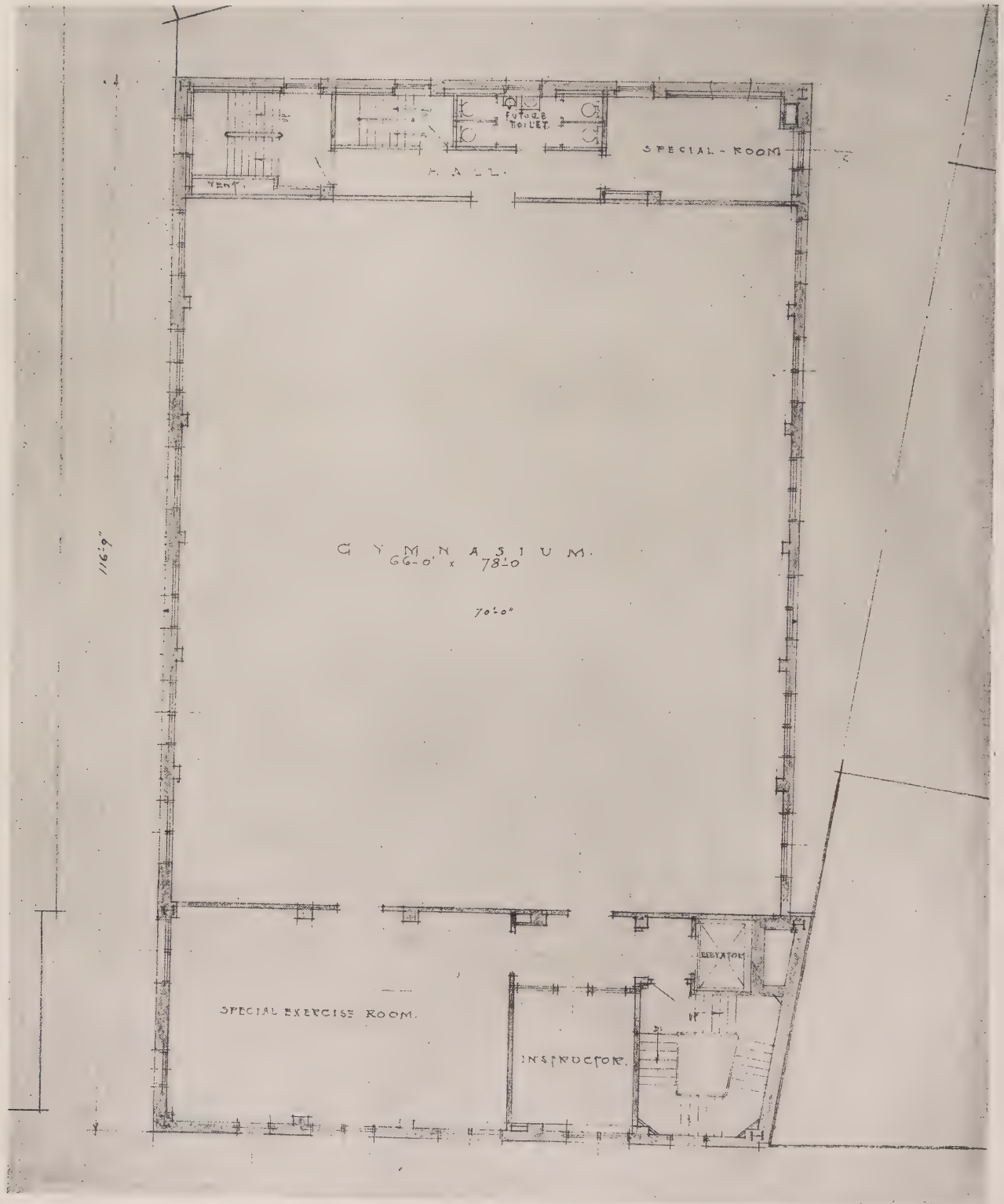
Sixth Floor Plan, Union Temple House, Brooklyn, N. Y.
 Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

OF MODERN BUILDINGS

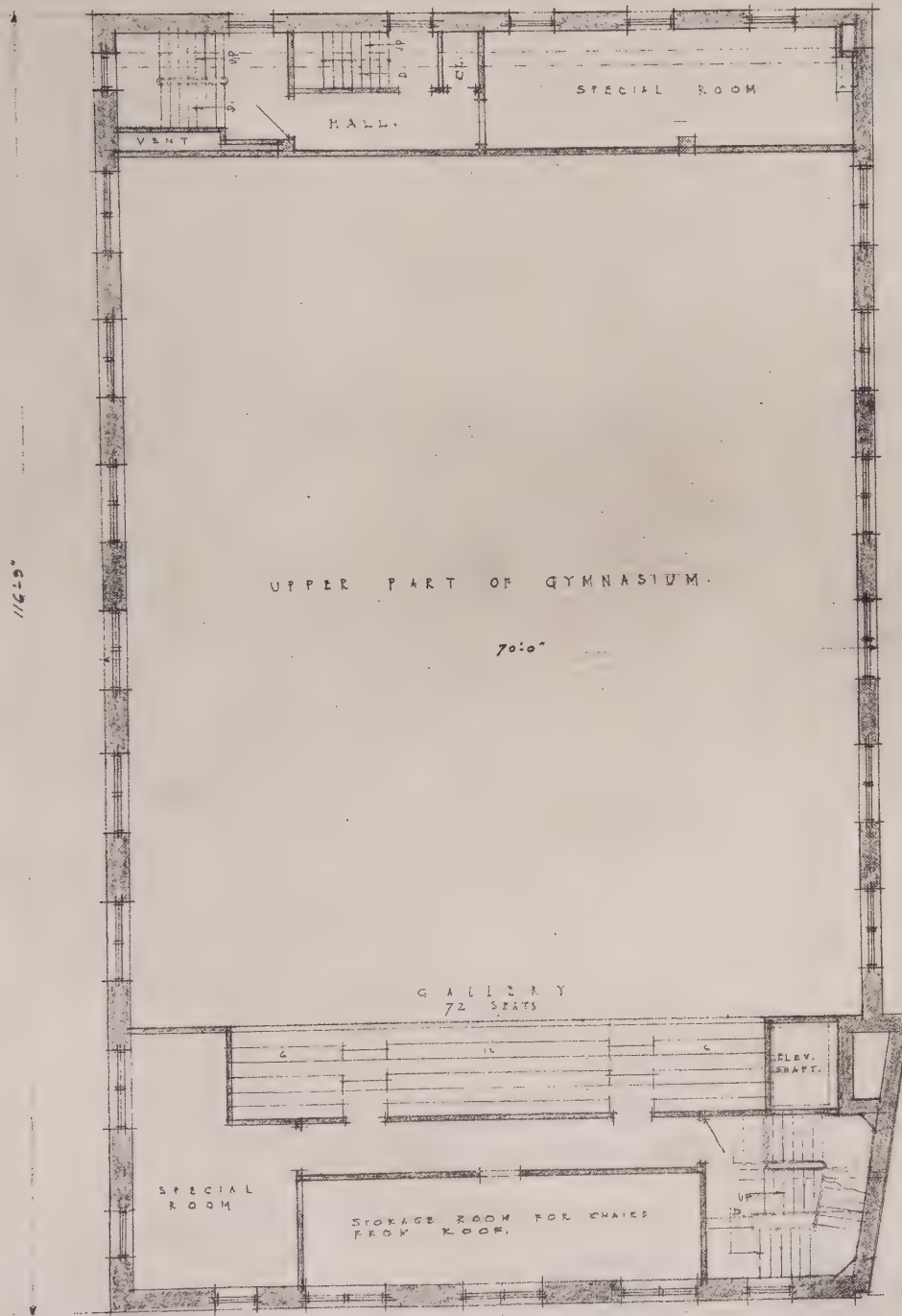


Seventh Floor Plan, Union Temple House, Brooklyn, N. Y.
Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

THE PRACTICAL REQUIREMENTS

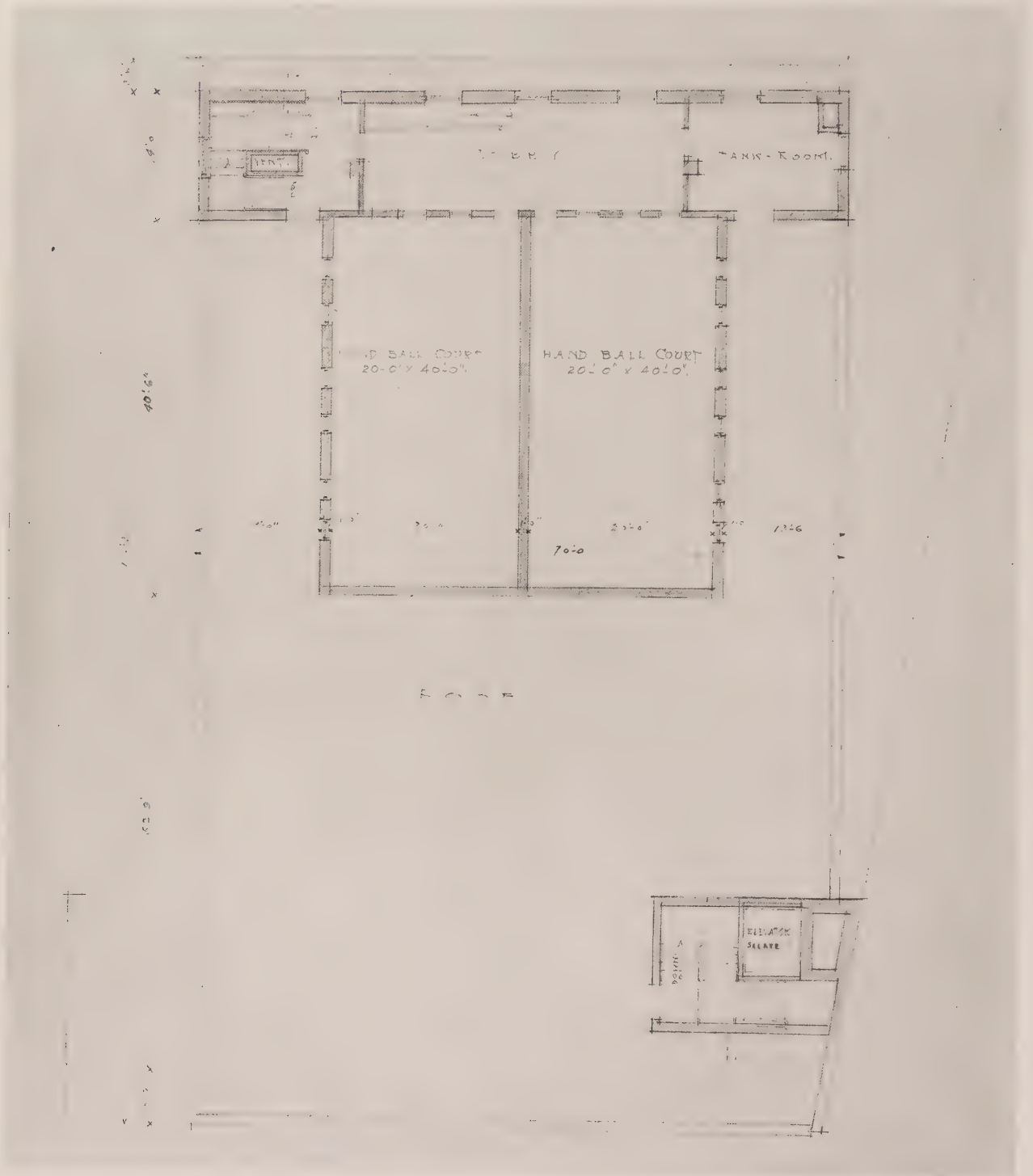


Eighth Floor Plan, Union Temple House, Brooklyn, N. Y.
Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)



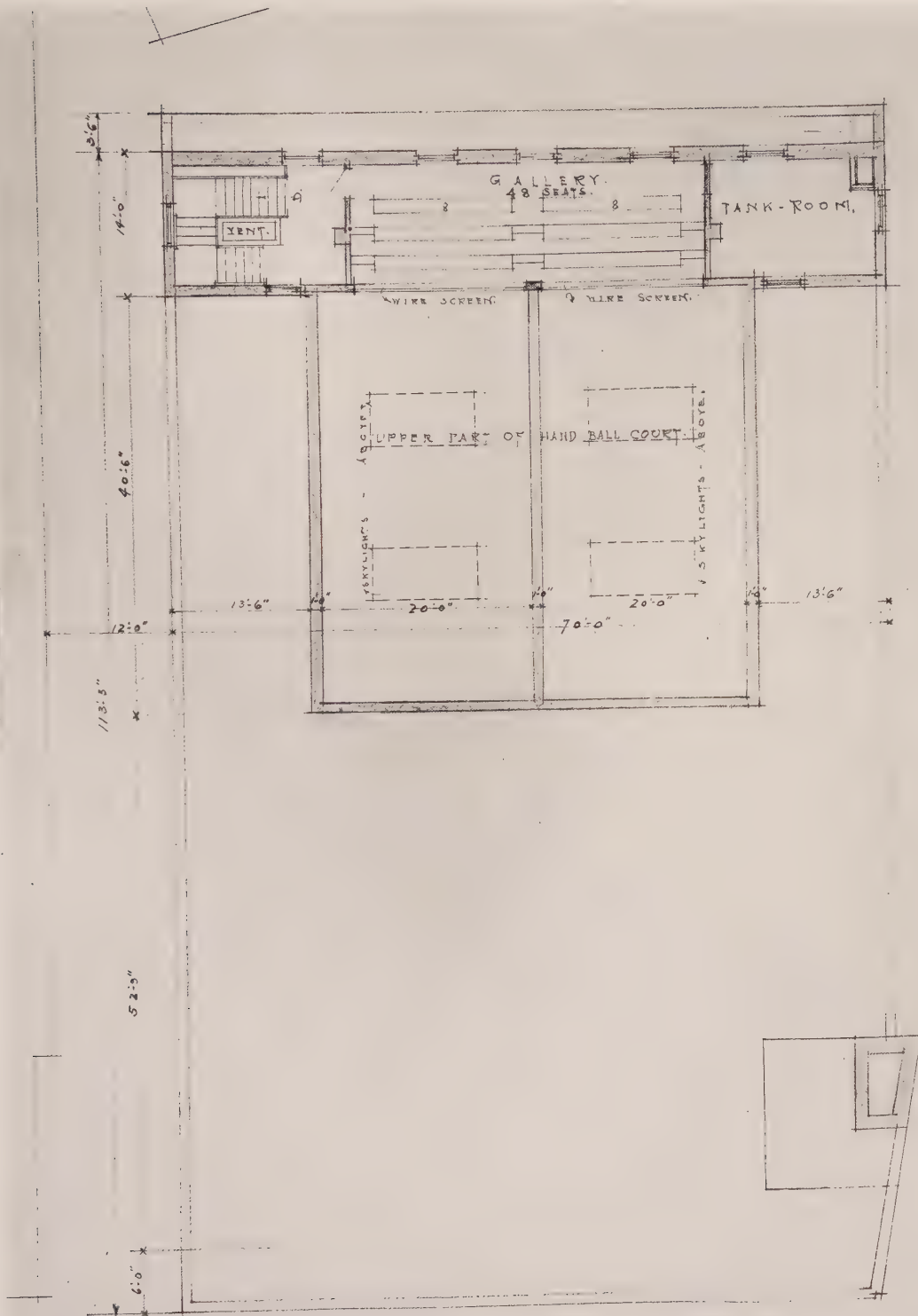
Ninth Floor, Union Temple House, Brooklyn, N. Y.
Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

THE PRACTICAL REQUIREMENTS



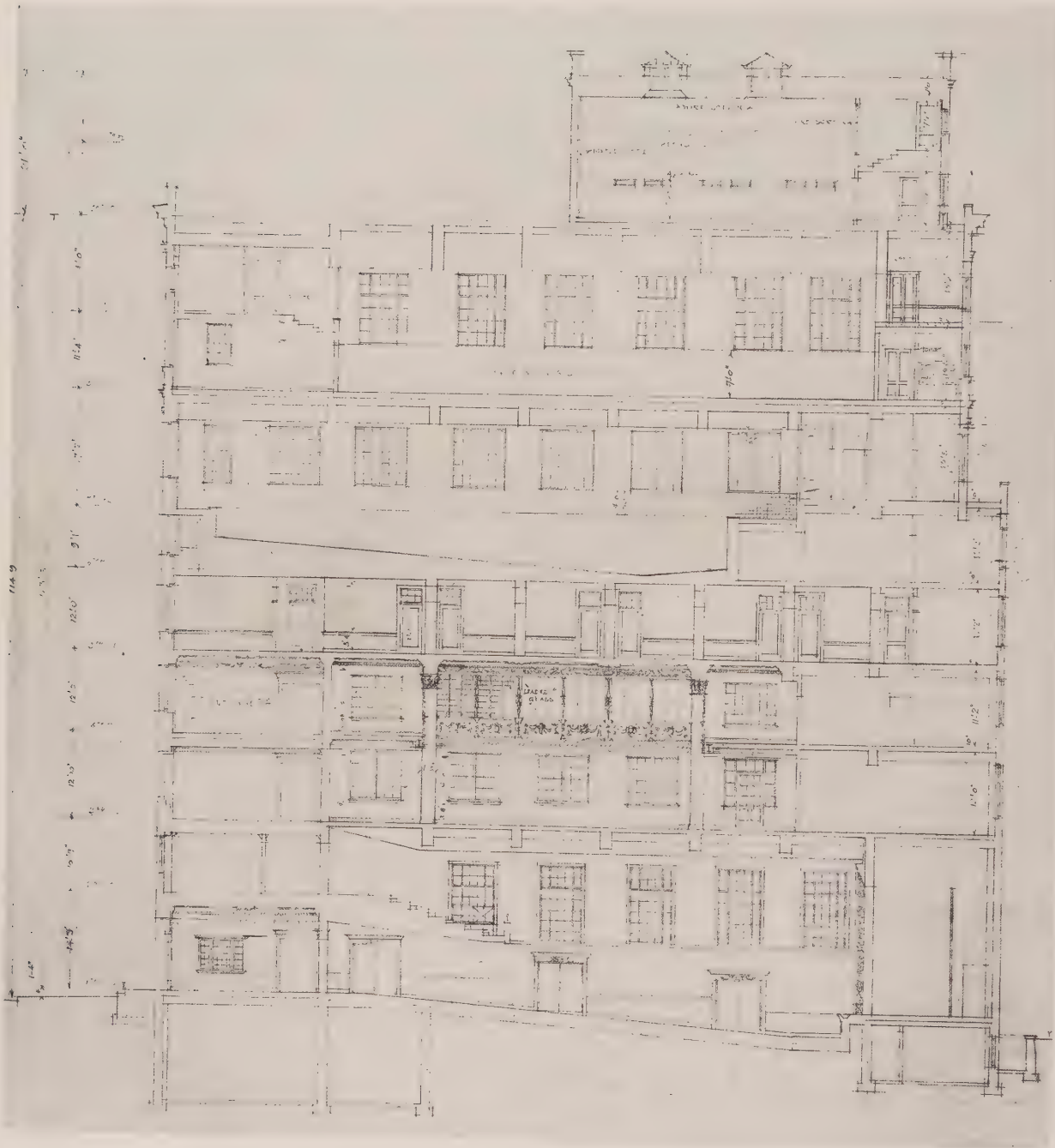
Tenth Floor, Union Temple House, Brooklyn, N. Y.
 Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

OF MODERN BUILDINGS



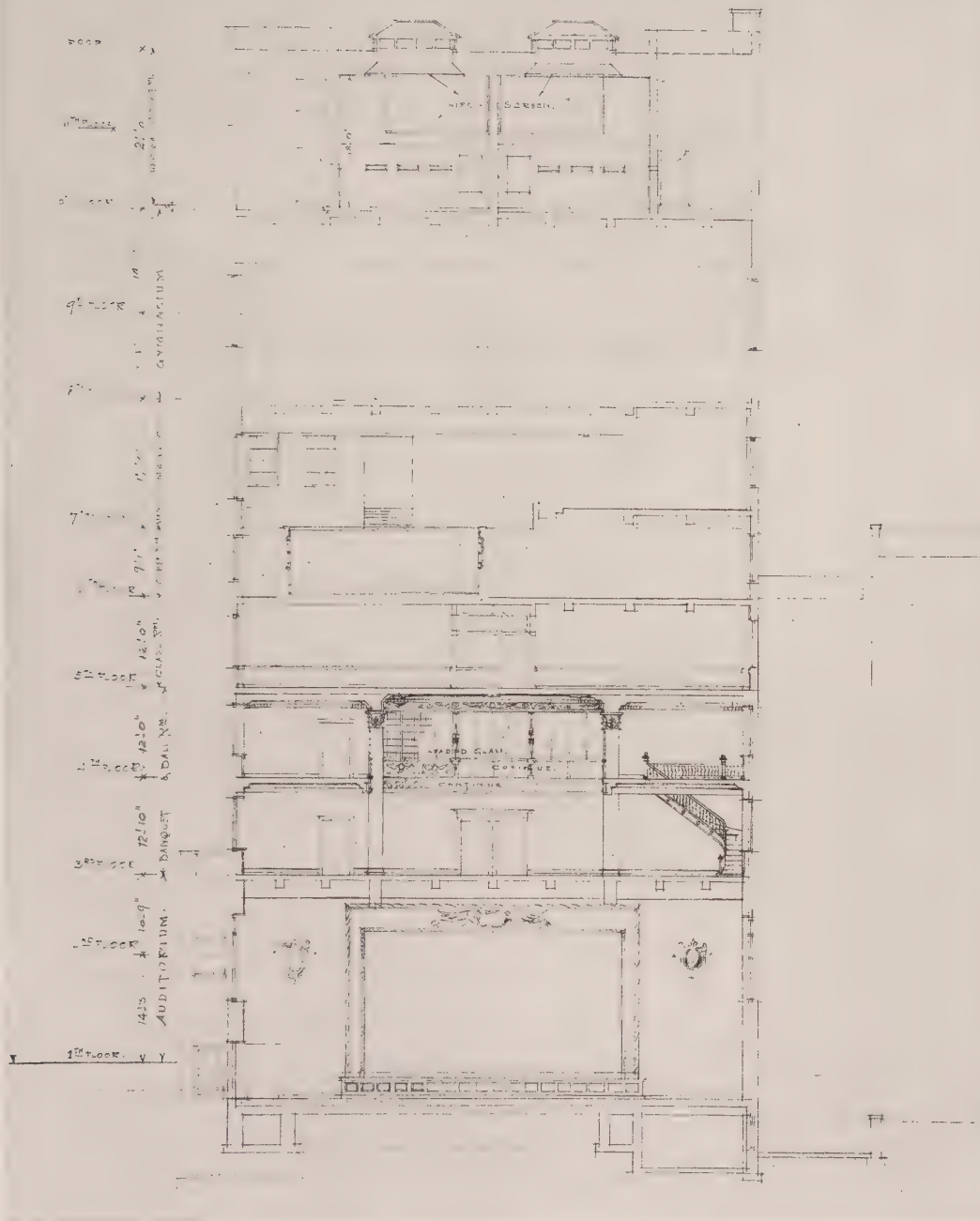
Eleventh Floor Plan, Union Temple House, Brooklyn, N. Y.
 Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

THE PRACTICAL REQUIREMENTS

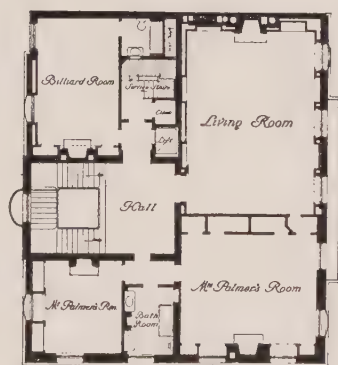


Longitudinal Section, Union Temple House, Brooklyn, N. Y.
Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)

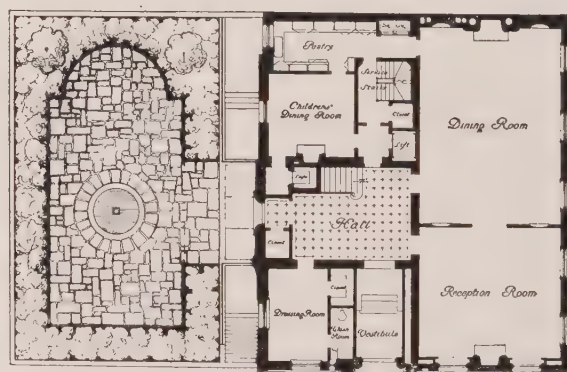
OF MODERN BUILDINGS



Transverse Section, Union Temple House, Brooklyn, N. Y.
Gehron, Ross & Alley, Architects (Arnold W. Brunner, Associates)



Plan of the Second Floor



Plan of the First Floor

Residence for Francis F. Palmer, New York City
Delano & Aldrich, Architects

CHAPTER V

RESIDENCES

HOMES, being the most intimate kind of architecture, reflect the changes in the minds and manners of the people more accurately than buildings of any other kind. It is, therefore, only natural that the planning of residences has undergone many changes in recent years. The relaxing of formality and the discarding of pretence are among the most marked of these changes. Instead of houses of moderate size that show an effort to imitate the mansions of more affluent home owners, we have had for many years simple, straightforward small and medium size house plans, designed to fit the kind of life their owners lead and to provide the greatest possible comfort and convenience.

Some years ago the reaction from the pretentiousness of the preceding period brought with it in some cases a specious kind of simplicity that was as false as the pretentiousness had been. Country houses that were really large were frequently designed after old farmhouse models, sometimes one story in height, with two more stories forced into the big roof and bursting out

in long dormers. It was a case of going too far in the opposite direction. Now, as a rule, the larger houses designed by the better architects have a delightful simplicity while the smaller houses have the dignity and charm that come with good scale and an appreciative use of historic precedent.

In the smaller houses the development of the living room has proceeded until now there are not a few houses of moderate size that have living rooms that are of a height equivalent to two ordinary stories. First came the living room with the large floor area, now ceiling height is being added. There is an increased sense of freedom and space in such a room that many people like, and there is greater dignity. Furthermore the decorative possibilities of a big, tall room are superior to those of a large room that has a low ceiling, generally. The introduction of tall living rooms into moderate size houses has been accomplished very successfully in the case of two residences shown here, the house at Kensington, Great Neck, L. I., Charles M. Hart, architect,



House at Kensington, Great Neck, L. I.
Charles M. Hart, Architect

and the house for Alfred M. Rau, Esq., at Greenville, N. Y., Mott B. Schmidt, architect. In the case of the former residence, the traditions of early English domestic architecture have been adapted very successfully, while in the latter case, the Early American farmhouse has served as the inspiration for the exterior treatment and the living room has been accommodated in the wing that was a familiar feature of the type. Giving people the kind of rooms that are suited to their manner of life and necessary to their happiness seems to the author to be just as truly a way of meeting a practical requirement as giving them seats in a theatre that command a good view of the stage, or doing any one of the many things that are ordinarily regarded as practical.

Many people prefer, for one reason or another, to live in the city, in small private houses and to keep their cars on the premises. Their requirements are admirably met by the row of houses built by Frank M. McCurdy, in Brooklyn, N. Y., Slee & Bryson, architects. As will be seen by reference to the plans on page 102, there are arched driveways that pass between the lower stories of adjoining houses and give access to the pair of garages at the rear. Each of these garages is connected with the house to which it belongs in such a way that it is not necessary to go out of doors to reach the garage. Bedrooms in the second story of each house extend half way over the arched drive. Beyond this point the drive becomes an open court between the buildings and gives light and air to the bathrooms. It provides also a window in each of the rear bedrooms, for cross draft. On the third floor there are bedrooms front and rear. The rooms in the rear are especially pleasant for they face the south and have good windows. Cutting off the rear corners of the house on the court at an angle has made possible the introduction of a window in the dining room to catch the sunlight from the south in addition to the light that comes through the pair of windows massed together upon the court. Each of these houses is equipped with an oil-burning heating

system, with a gas water heater, in the cellar, and with other up-to-date conveniences.

A different solution of the problem of the small city house with garage is seen in the residence of Augustus G. Paine, Esq., New York City, C. P. H. Gilbert, architect. The plans and section on page 103 show the arrangement clearly. This plan, of course, calls for a plot that extends through the block, from street to street. A photographic view of the garage, with the pergola of the roof garden above, and the rear of the house in the distance, is shown on page 104.

A means of securing light from more than one side in a city house and a garden that provides a pleasant outlook from the windows is well worked out in the case of the residence for Francis F. Palmer, Esq., New York City, Delano & Aldrich, architects. The photograph and plans on page 98 tell the story.

On a country estate the contour of the ground and the need for locating the principal rooms in such a way that they command the best view give rise to a set of requirements that do not exist in the city or suburbs, where the building site is a small plot. An inter-

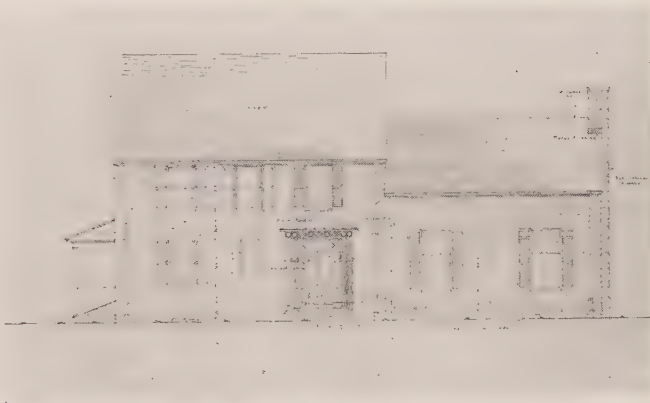


Living Room in House at Great Neck, Long Island
Charles M. Hart, Architect

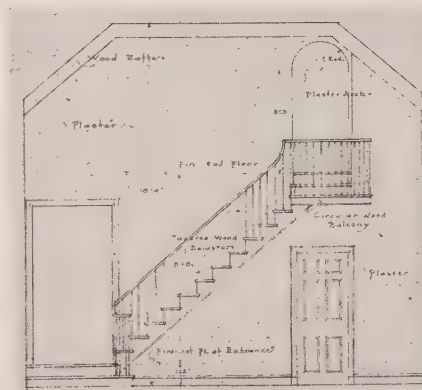
esting example of the successful meeting of problems of this nature is the house for Charles H. Sabin, Esq., at Southampton, L. I., Cross & Cross, architects. The property slopes towards the north from the edge of a level area over which the site is approached. The house has been placed slightly below the top of this slope, and in this way, as well as by means of the lines of its silhouette, it has been made to fall in with the long level lines of the ground on the entrance side. Then a small ravine that extended down the slope in a north-westerly direction was turned to account as a sunken garden and the living room wing was built at such an angle to the rest of the house that the row of mullion windows in the side of this room commands a view down the axis of the sunken garden—see plan on page 105. The other features of the plan were developed to meet the practical requirements of the household. Through this straightforward and intelligent



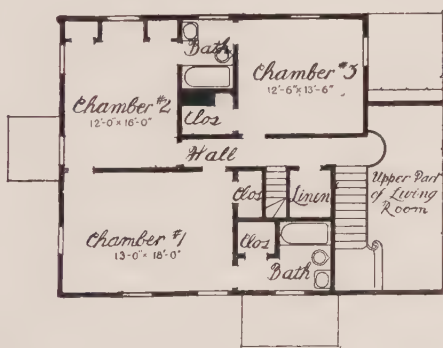
End Elevations



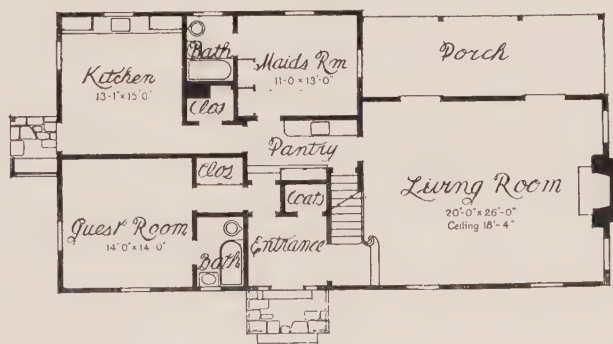
Front Elevation



End of Living Room



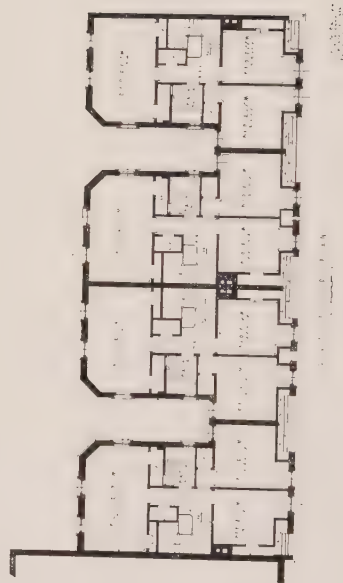
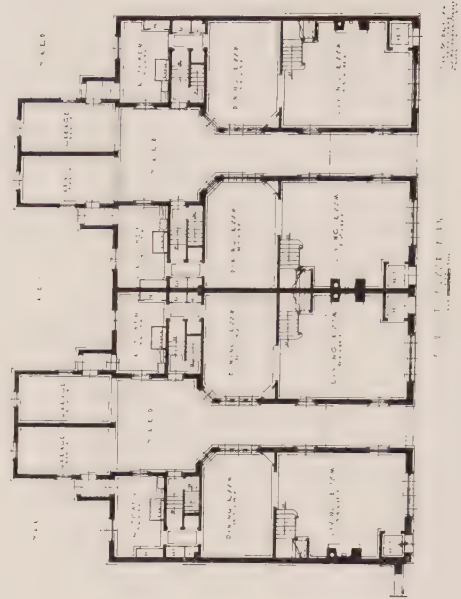
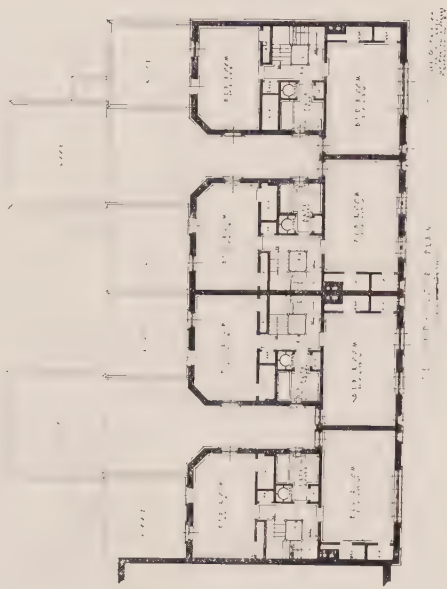
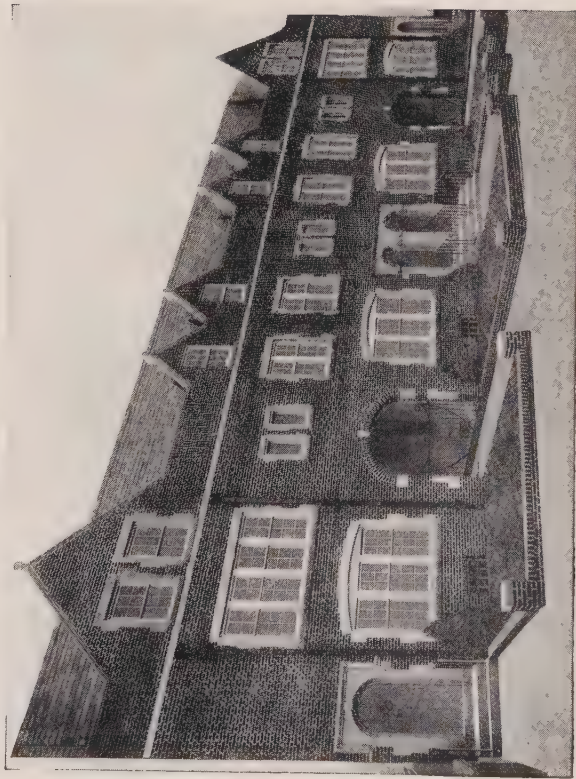
Second Floor Plan



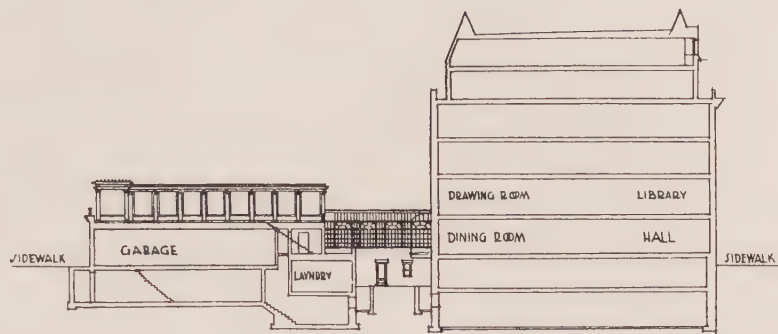
First Floor Plan

House for Alfred M. Rau, Esq., at Greenville, N. Y.

Mott B. Schmidt, Architect



Houses for Frank M. McCurdy, Third Street, near Eighth Avenue, Brooklyn, N. Y.
Slee & Bryson, Architects



Section Through House and Garage



First Floor

Garage

Second Floor

Plans and Sections, House for Augustus G. Paine, New York City

C. P. H. Gilbert, Architect



House for Charles H. Sabin, at Southampton, L. I.
Cross & Cross, Architects

solving of the problem, a house of unusually interesting character has been developed. Of course, the skill and cultivated taste of the architects played an important part in the achievement of this result.

The importance of obtaining definite information concerning the practical problems presented by the nature of the building site is becoming better understood and the making of a topographical survey and a contour map is now recognized as a highly important preliminary to the making of even a tentative study for the design of a residence that is to have any considerable area of ground about it.

The requirements of the owner have found expression in the very interesting plan of the house for J. A. Burden, Esq., at Syossett, L. I., Delano & Aldrich, architects—see page 106. As facilities for entertaining people in considerable numbers at formal social functions were required, a men's reception room was provided with coat room and toilet, accessible from the circular entrance hall, for the convenience of the arriving male guests, while similar accommodations were provided for the

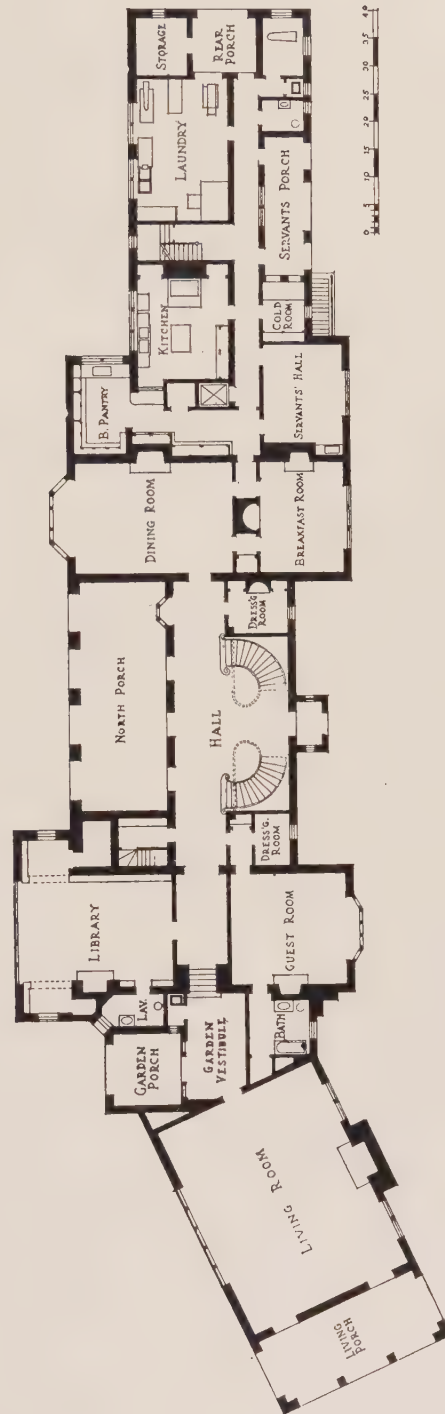
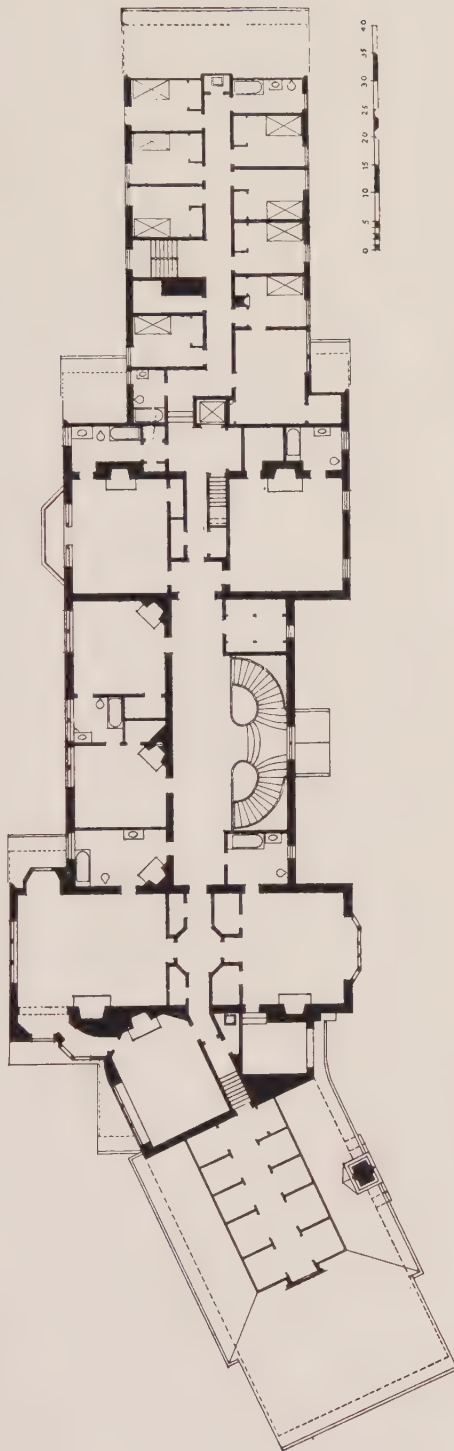
women down the corridor towards the west. Both of these rooms lie where the guests can reach them before entering the assemblage. A group of rooms was wanted for the use of the sons of the owner and this brought about the arrangement in the section at the west end of the building, on the right-hand side of the plan. The partial detachment of this section from the main house

makes this practically a private apartment. The needed servants' quarters have been provided at the east end of the plan, adjoining the service end of the house.

A set of conditions entirely different from those in either of the two houses just considered is found in the house for D. M. Ferry, Esq., Grosse Pointe, Mich., Trowbridge & Ackerman, architects—the plans are shown on page 107. The requirement for a breakfast room porch brought about the placing of a loggia at the corner adjoining the dining room, where it can be served from the butler's pantry. A suitable space for a pipe organ had to be provided; terraces commanding the best view were desired. The requirements give the key to the designing of distinctive homes.



Garage at Rear of House for Augustus G. Paine,
New York City
C. P. H. Gilbert, Architect



First and Second Floor Plans, House for Charles H. Sabin, Esq., Southampton, L. I.
Cross & Cross, Architects



FIRST FLOOR PLAN

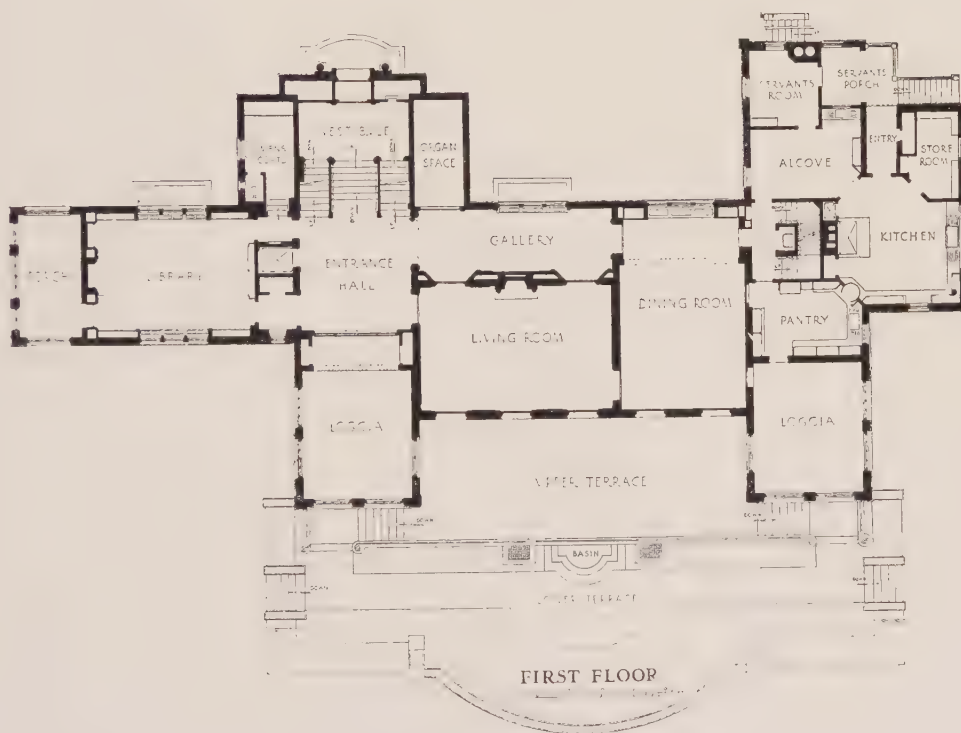
House for J. A. Burden, Esq., at Syossett, L. I.
Delano & Aldrich, Architects

OF MODERN BUILDINGS



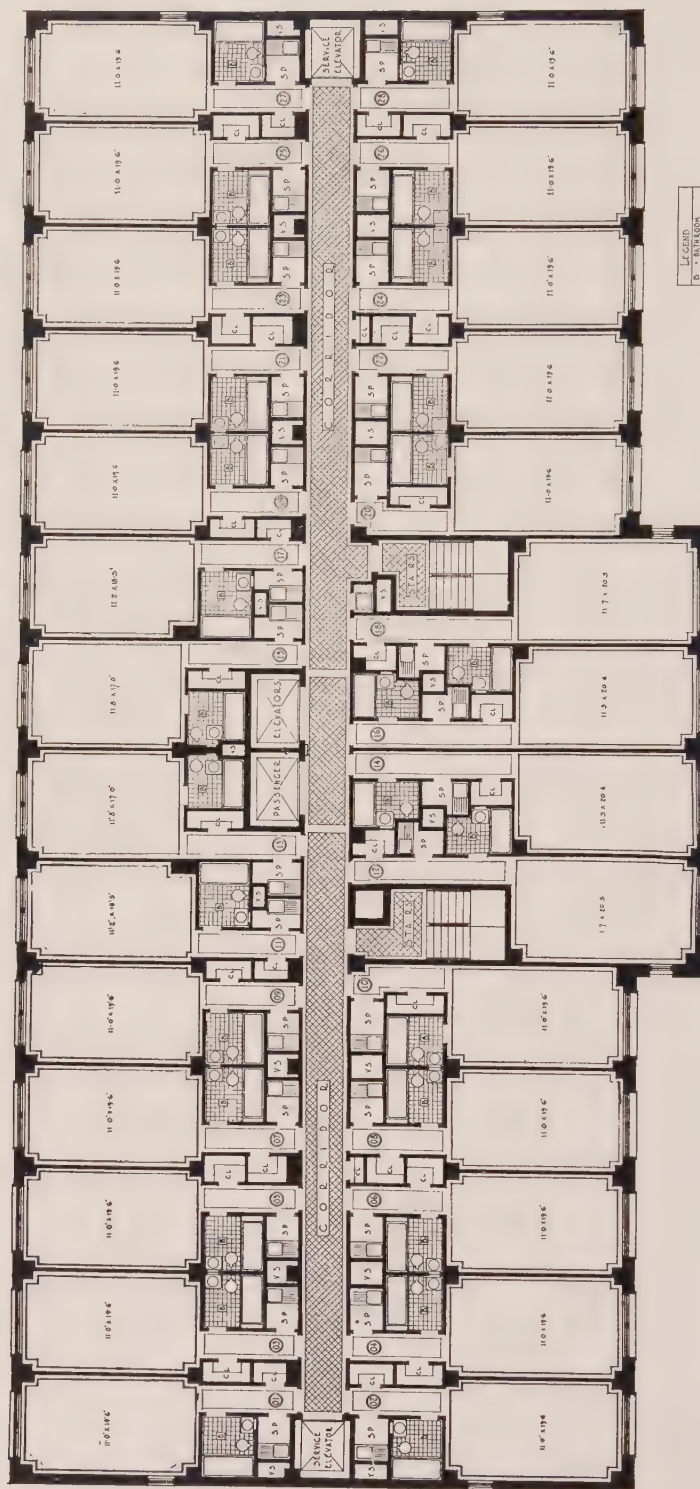
SECOND FLOOR

10 FEET



FIRST FLOOR

Residence of D. M. Ferry, Esq., Grosse Pointe, Mich.
Trowbridge & Ackerman, Architects



The Belvedere, New York City
John and Laurence Scaschatti, Architects

CHAPTER VI

HOTEL BUILDINGS

FOR hotels of the commercial type, standards of practice have been arrived at that are rather generally followed throughout the country. These hotels are designed to supply the needs of transient guests, who require rooms that are of moderate size, light, airy, clean and furnished in an attractive, though not elaborate manner.

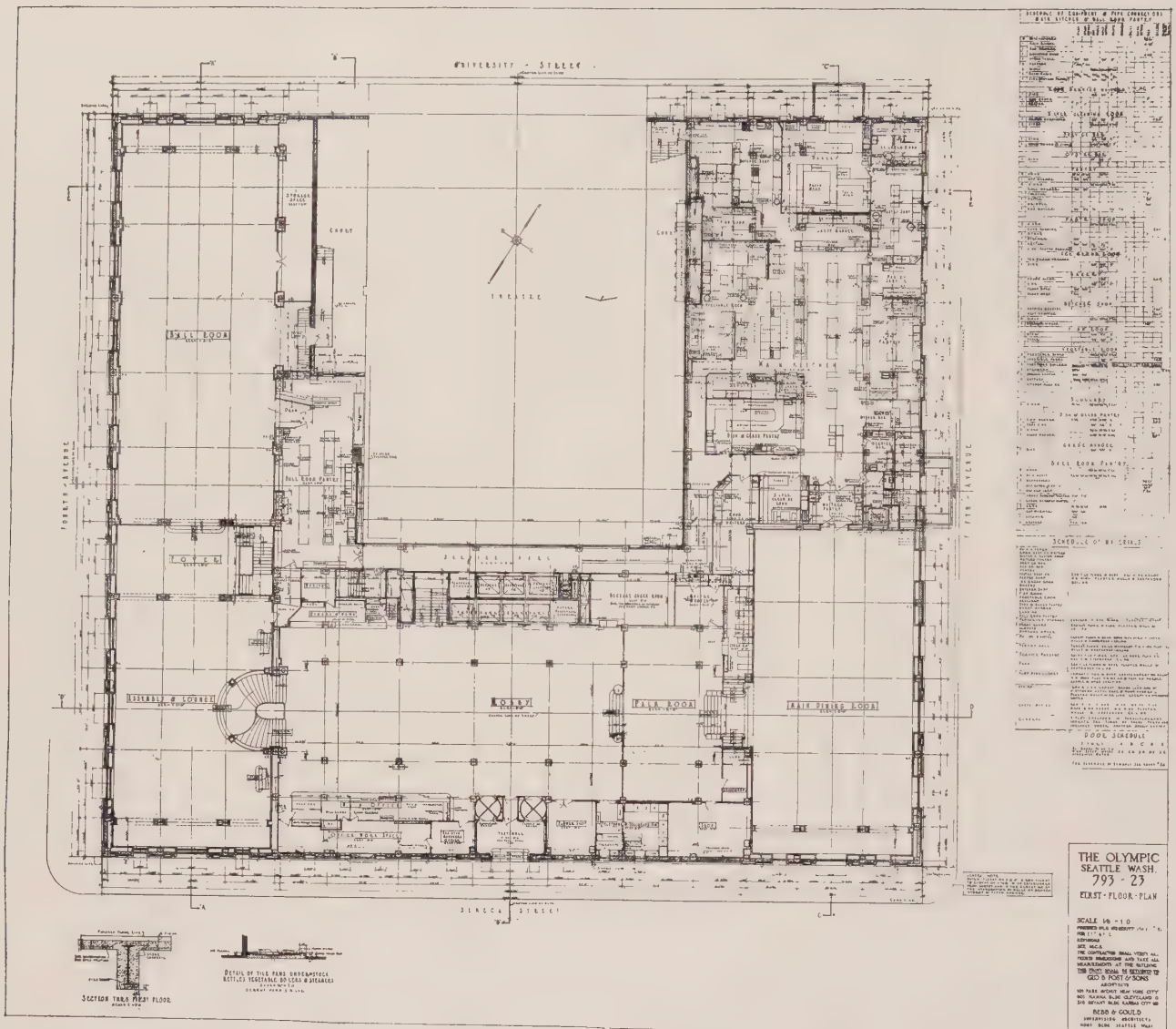
The Olympic Hotel, Seattle, Washington, is a good example of this type of hotel. The bedroom floors are so planned that the outer walls are available for windows of good size, the bathrooms and closets being kept along the corridors. This arrangement, which is now widely used, not only leaves a good rectangular room that furnishes well, but provides a separation between the rooms and the corridors that cuts down the transmission of sound. It also gives a degree of privacy, since the doors open into the private halls instead of opening directly into the rooms. This arrangement can be seen clearly in the portion of a typical floor plan of this hotel that is reproduced on

page 112 and that of the Belvedere shown opposite.

Since commercial travellers constitute a large part of the travelling public, many hotels have rooms in which they can display their samples to advantage. The portion of the plan of a sample room floor in the Olympic Hotel reproduced on page 113 shows well planned sample rooms. It will be noted that these sample rooms are larger than the ordinary bedrooms and that each one has an adjoining dressing room into which the bed disappears when not in use, leaving additional space needed in displaying samples of merchandise. The sample rooms should be grouped together on one or more floors or on a section of a floor, according to the size of the hotel, in order that the going and coming of buyers may not disturb people who are not transacting business in their rooms, but may need to rest. The sample rooms should preferably be on the lower floors where they are most easily accessible and there must be ample freight elevator facilities for handling the many trunks of the salesmen.



Design for The Olympic Hotel, Seattle, Washington
George B. Post & Sons, Architects



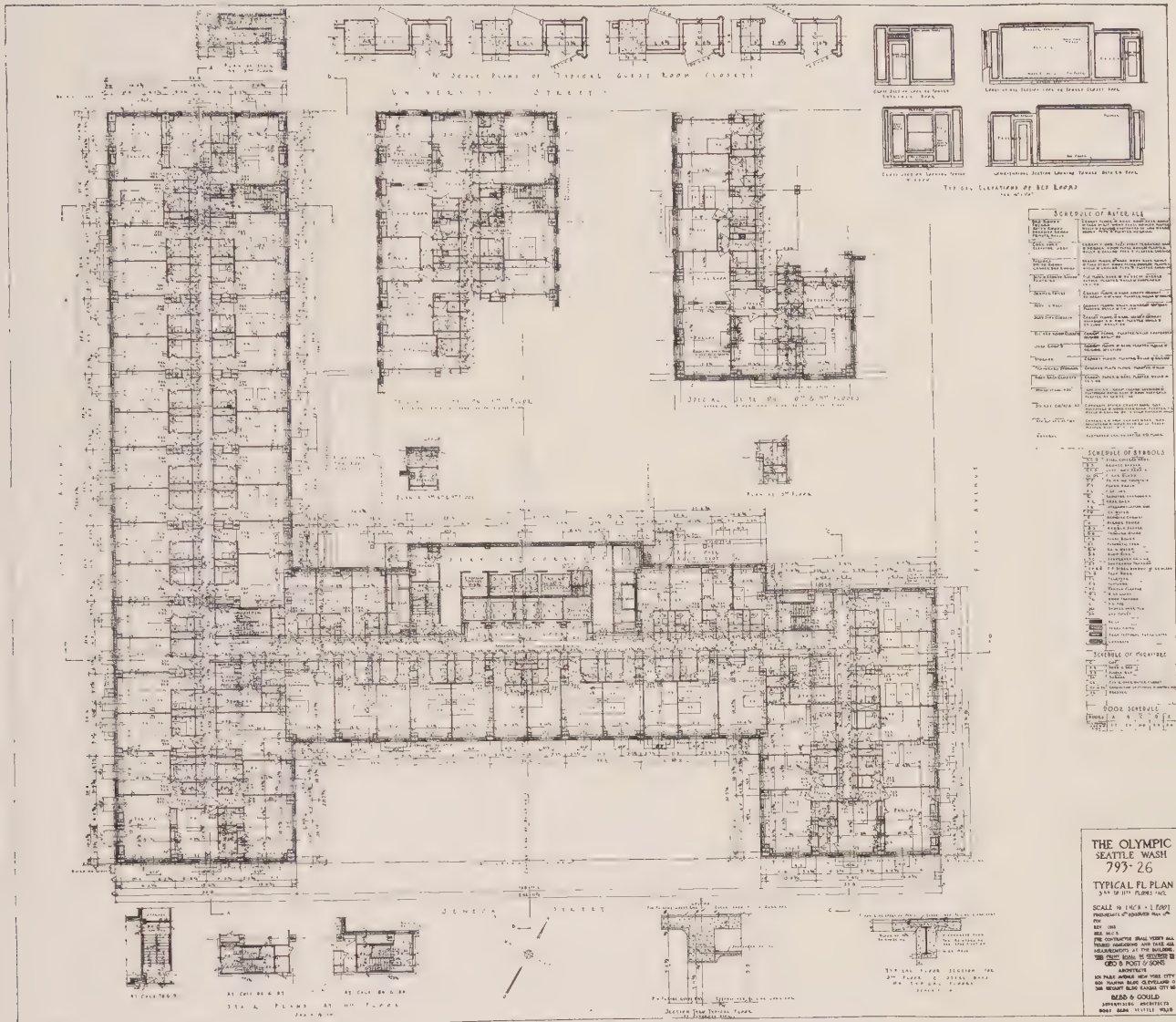
First Floor Plan, The Olympic Hotel, Seattle, Washington
George B. Post & Sons, Architects

The kitchen of a hotel is one of its most important parts as well as its most complex feature, so far as equipment is concerned. Its location in relation to the dining rooms and restaurants, when there are two or more rooms to be served, must be carefully studied in order that the communication may be good. It is usually well to give the kitchen a place in the plan that is as nearly central as possible, so far as the dining rooms and restaurants are concerned.

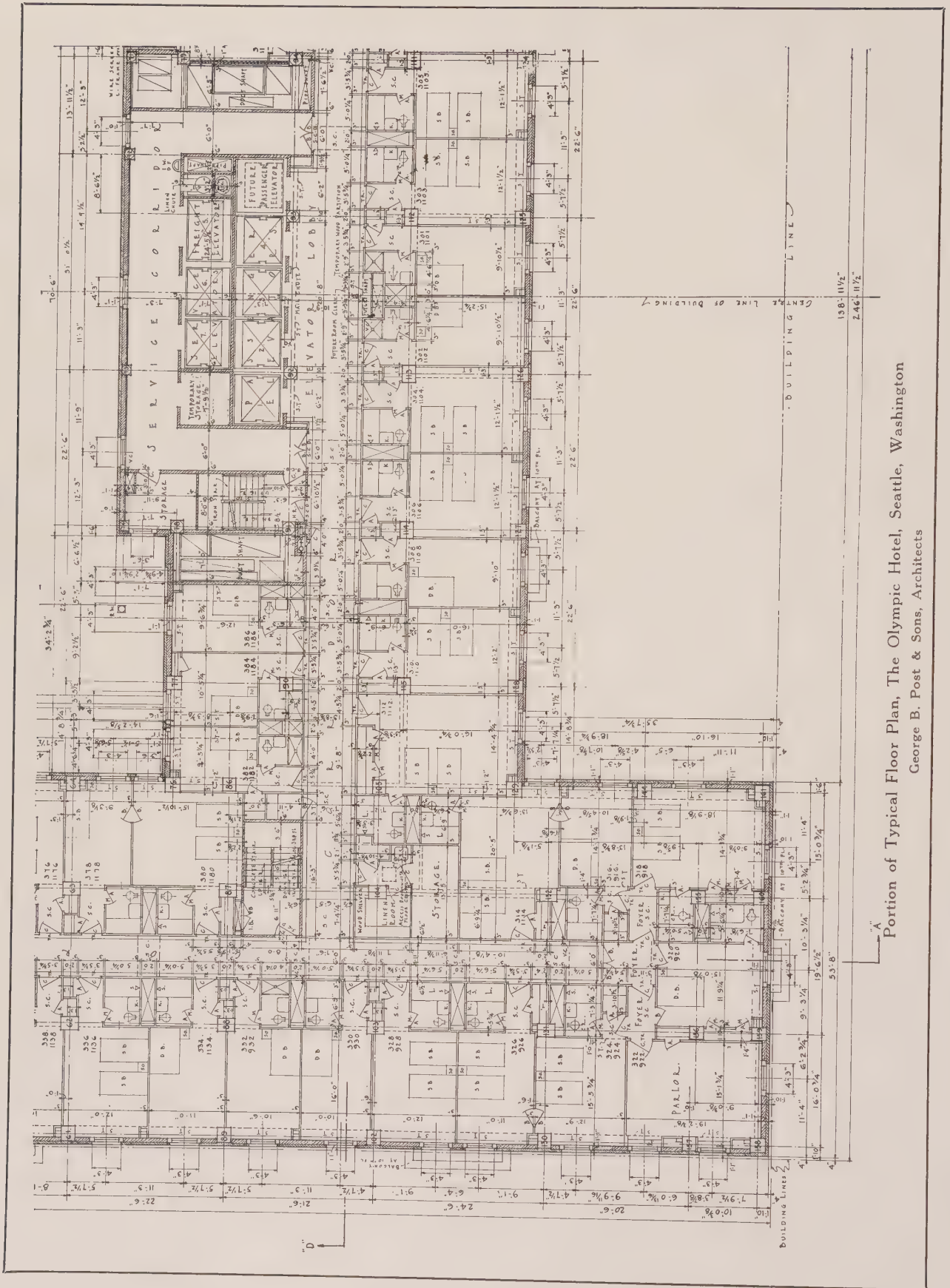
The arrangement and equipment of a good hotel kitchen is clearly shown by the portion of a plan of the Olympic Hotel reproduced on page 114. The requirements of each hotel in this respect vary considerably, but the essentials are shown here. It is important for the architect to study the equipment of the kitchen thoroughly in consultation with the hotel management and the representatives of manufacturers of equipment of

this kind between the time of the making of the preliminary drawings and the making of the working set. A plan of the kitchen drawn at large scale should be made with all of the equipment drawn in at the correct size, in order that the area and shape of the kitchen unit of the plan may be known definitely before the making of working drawings is begun. In the past it has been the common practice to neglect the making of such a drawing, with the result that the kitchens of hotels have usually been inadequate in size and did not lend themselves to the best arrangement of the various divisions and pieces of equipment needed.

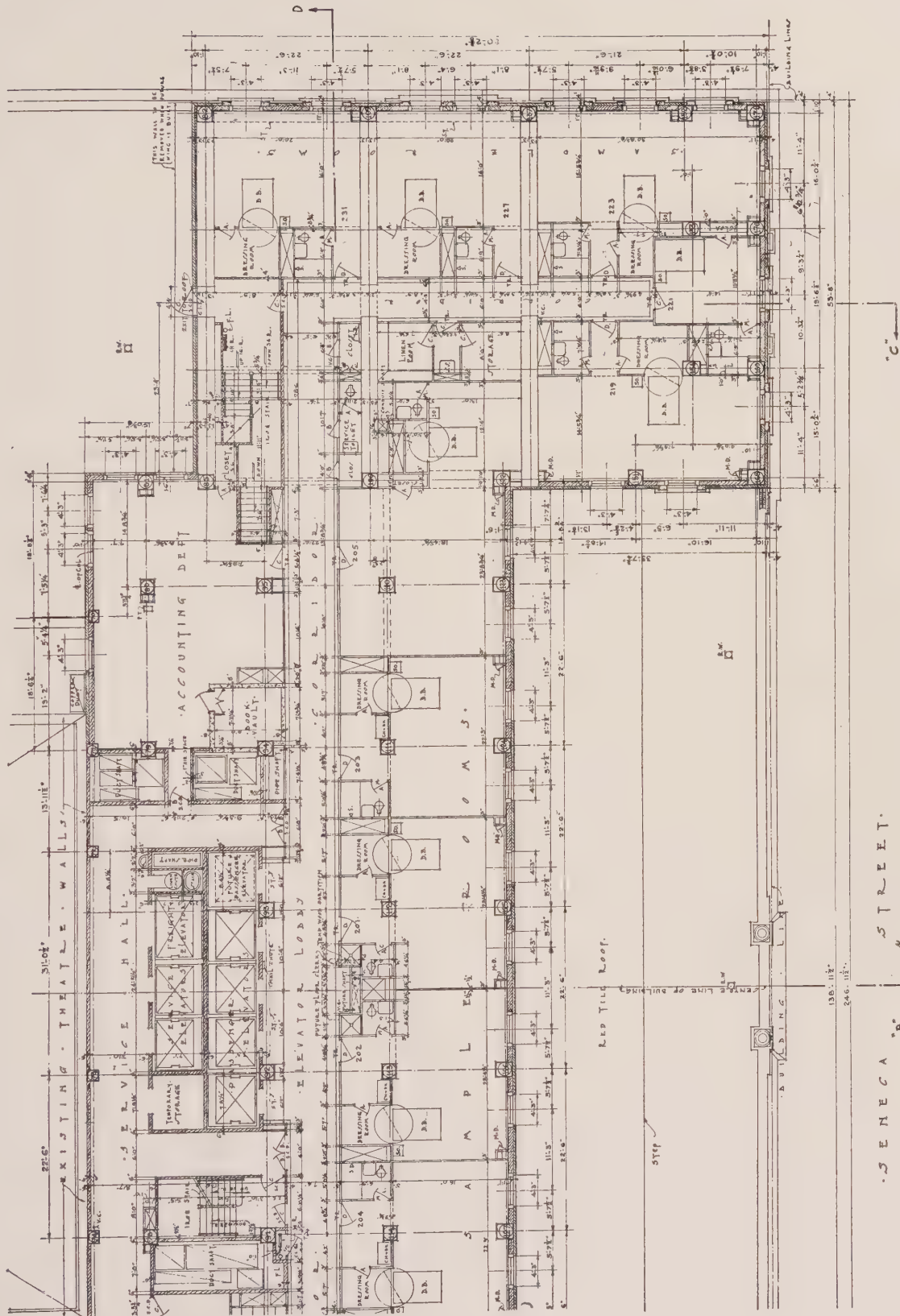
From this large-scale study of the kitchen, the data may be transferred to the working drawings with the assurance that there will be no unpleasant surprises in the carrying out of the work and no dissatisfaction with the kitchen when it is in operation, if the problem has been well studied.



THE PRACTICAL REQUIREMENTS

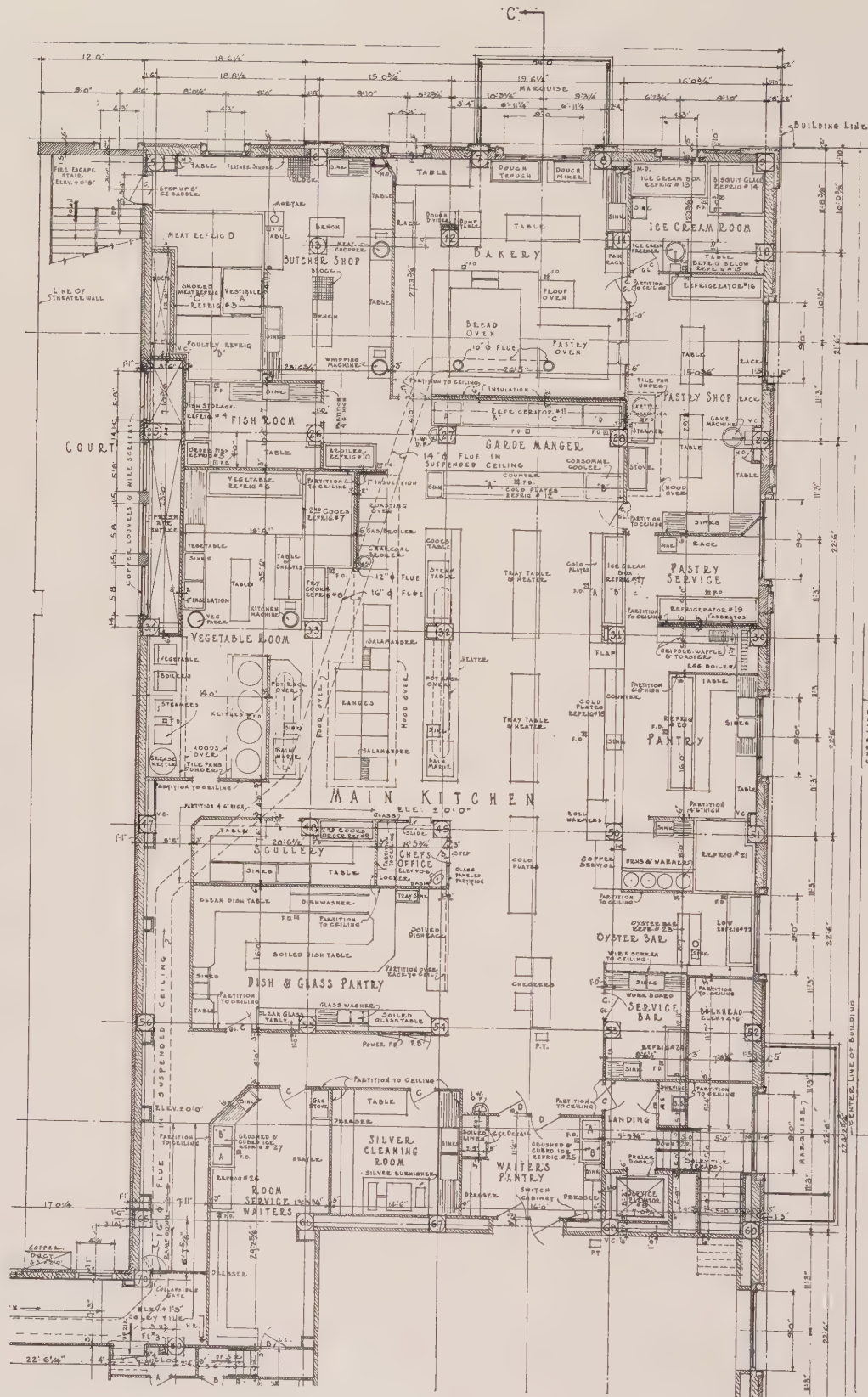


Portion of Typical Floor Plan, The Olympic Hotel, Seattle, Washington
George B. Post & Sons, Architects



JENEGA "B" STREET "C"
 Portion of the Sample Room Floor, The Olympic Hotel, Seattle, Washington
 George B. Post & Sons, Architects

THE PRACTICAL REQUIREMENTS



Plan of Main Kitchen, The Olympic Hotel, Seattle, Washington
George B. Post & Sons, Architects



The Bon Air Vanderbilt Hotel, Augusta, Georgia
Willis Irvin and McKim, Mead & White, Architects

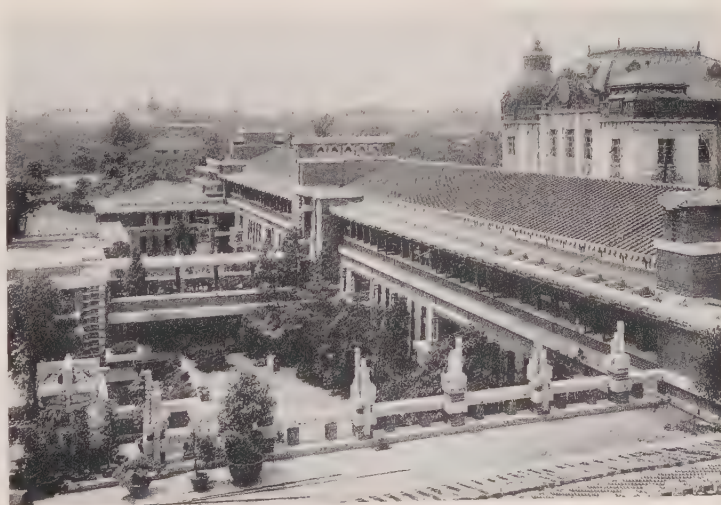
The exterior treatment of the Olympic Hotel, which is well adapted to a building of its type, is seen in the architects' perspective drawing reproduced on the first page of this chapter.

The Belvedere on West Forty-eighth Street, west of Broadway, New York City, presents a highly successful solution of the problem of providing living quarters that are homelike and have an air of refinement and elegance at a moderate price, in the heart of the city. This hotel is occupied largely by resident guests. The rooms are extremely pleasant, being of such proportions and size that they furnish well, and having big mullion windows that admit plenty of light and air. A typical floor plan of this hotel is shown on page 108.

Each room has a bathroom that is of ample size and unusually well equipped, also a serving pantry and a large clothes closet. The bathroom, serving pantry and clothes closet form a group in each case between the room and the corridor,

and each room has a good private hall. The furnishings of a typical room are as follows: a double bed, night table, dressing table, chiffonier, large wing chair, side chair, writing desk, bench, and two floor lamps, all of which are accommodated with room to spare. Other schemes of furnishing also work out satisfactorily, some including a bed that folds into a divan in place of a bed of the usual type.

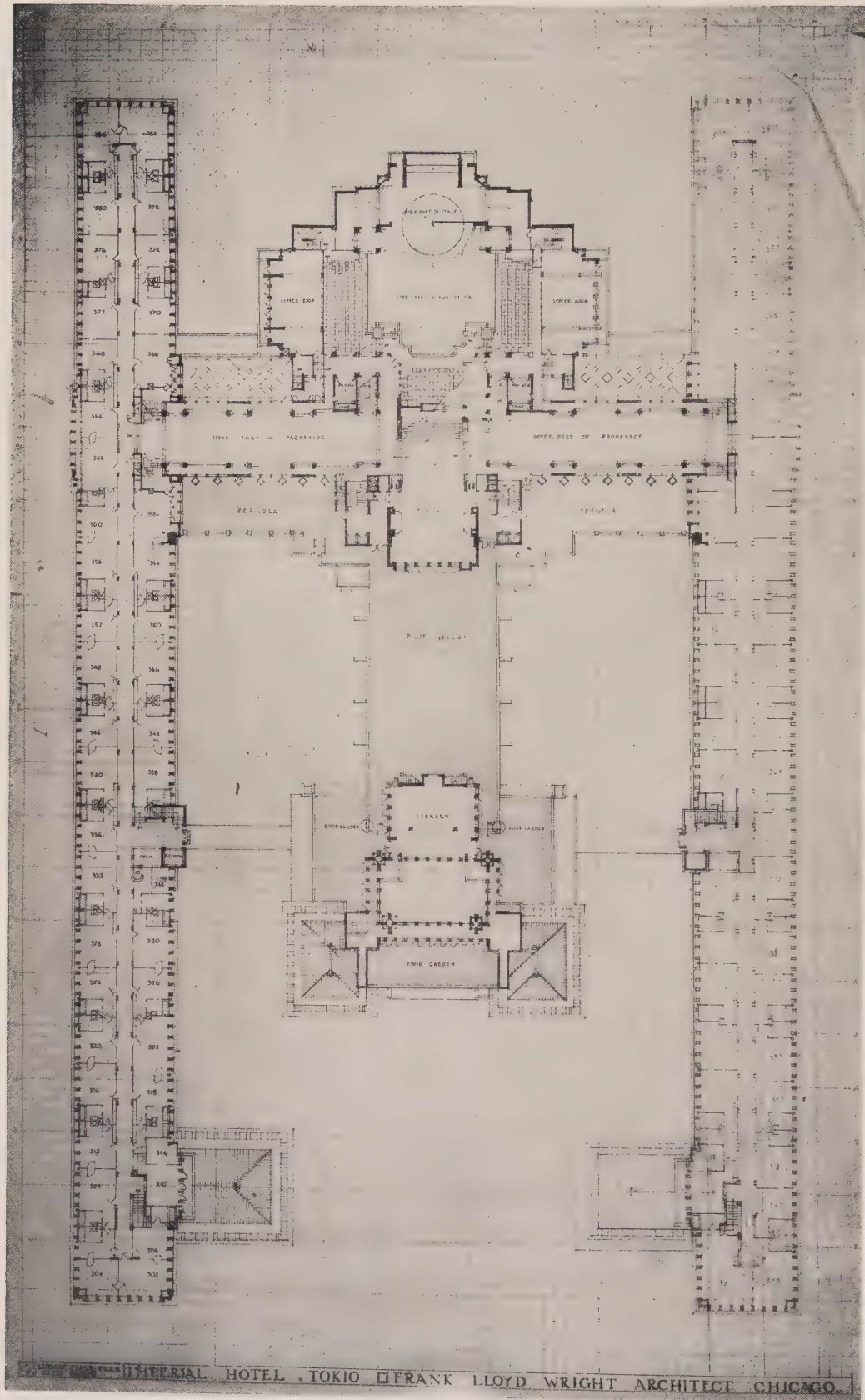
The public rooms on the ground floor provide ample space and are so designed and decorated that they create a very pleasant impression. The entrance is in the center of the front, in the part of the plan that projects slightly. The front office is at the left of the lobby, which extends to the passenger elevators. A large public room, furnished in the Spanish Renaissance style, occupies the space at the north of the elevators. It is reached by descending two or three steps. This gives it the added height of ceiling that is desirable, the ceiling of the



View in the Court of The Imperial Hotel,
Tokyo, Japan

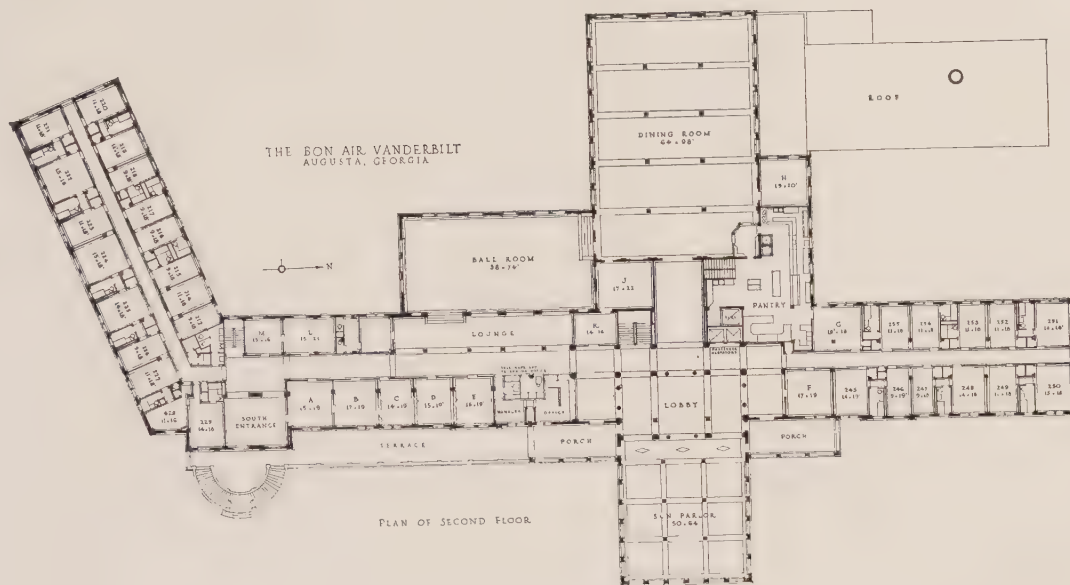
Frank Lloyd Wright, Architect

THE PRACTICAL REQUIREMENTS

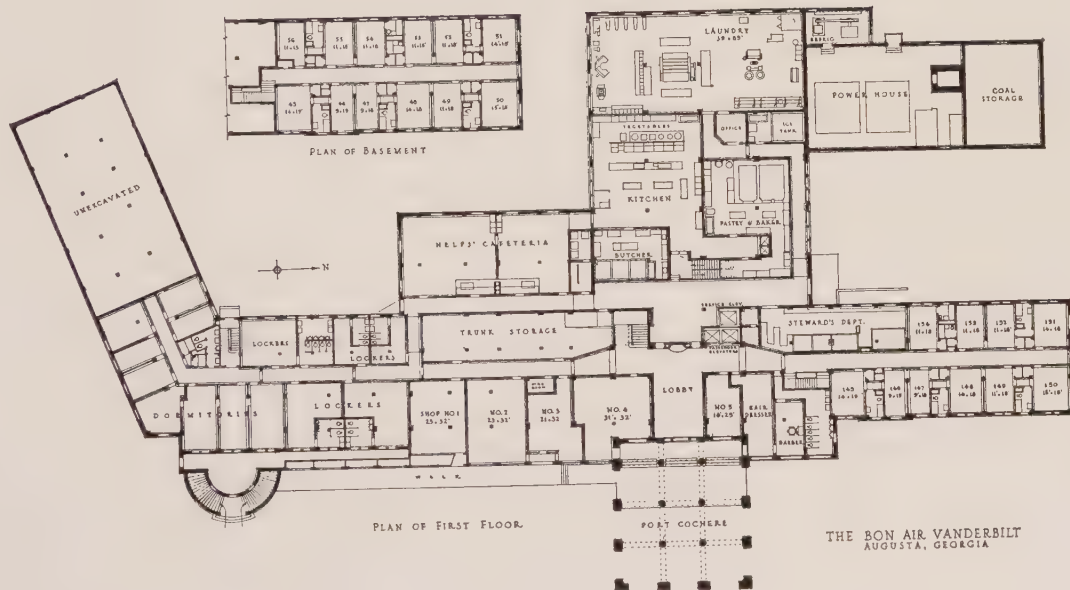


Floor Plan, The Imperial Hotel, Tokyo, Japan
Frank Lloyd Wright, Architect

OF MODERN BUILDINGS

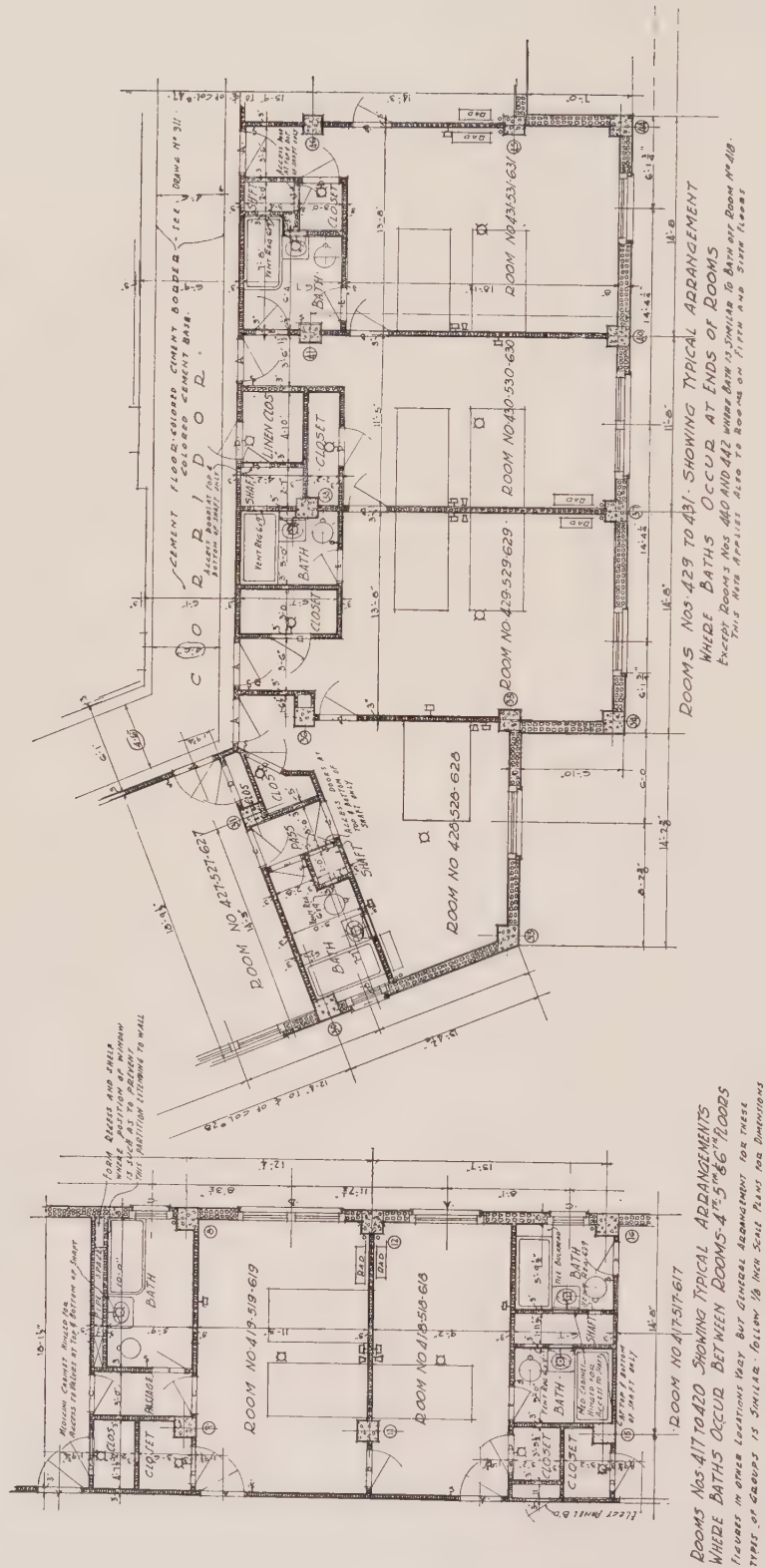


Second Floor Plan



First Floor Plan

The Bon Air Vanderbilt Hotel at Augusta, Georgia
Willis Irvin and McKim, Mead & White, Architects



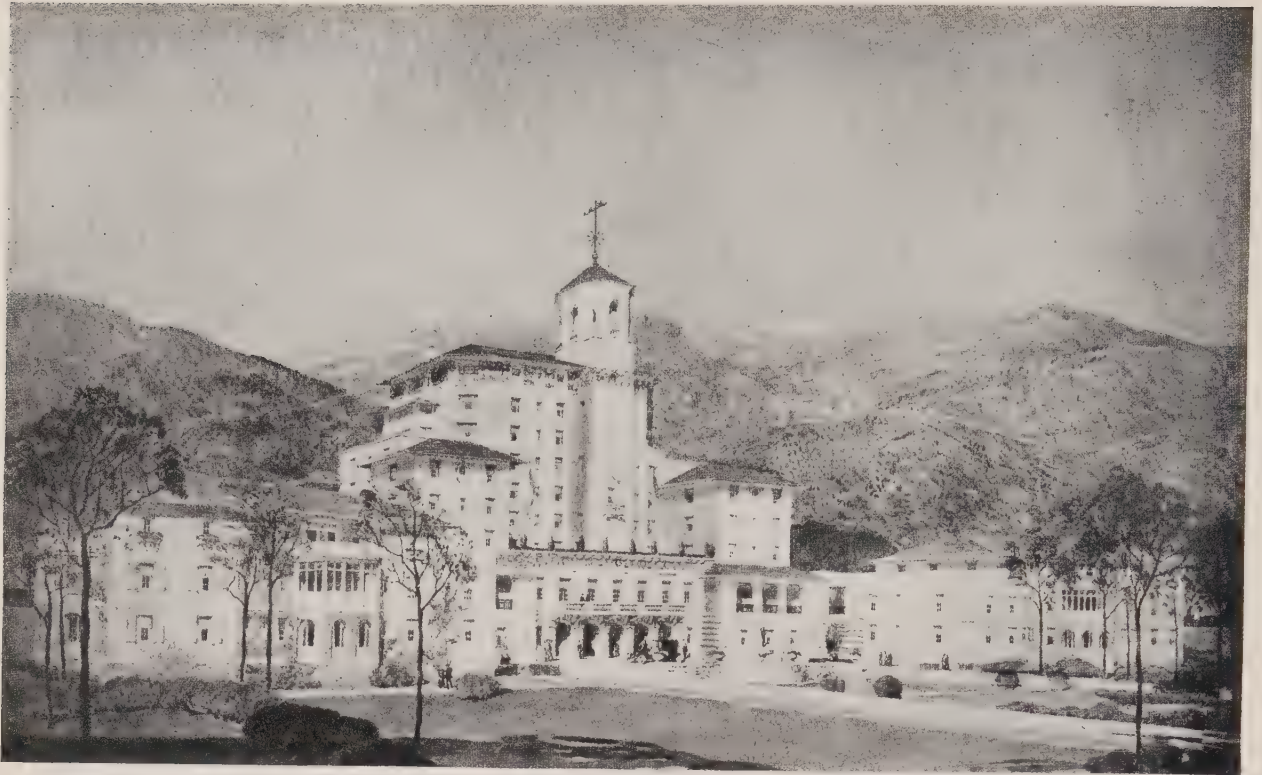
Portion of Second Floor Plan, The Bon Air Vanderbilt Hotel, Augusta, Georgia
Willis Irvin and McKim, Mead & White, Architects



Portion of Typical Floor Plan, The New Colonial Hotel, at Nassau, Bahama Islands

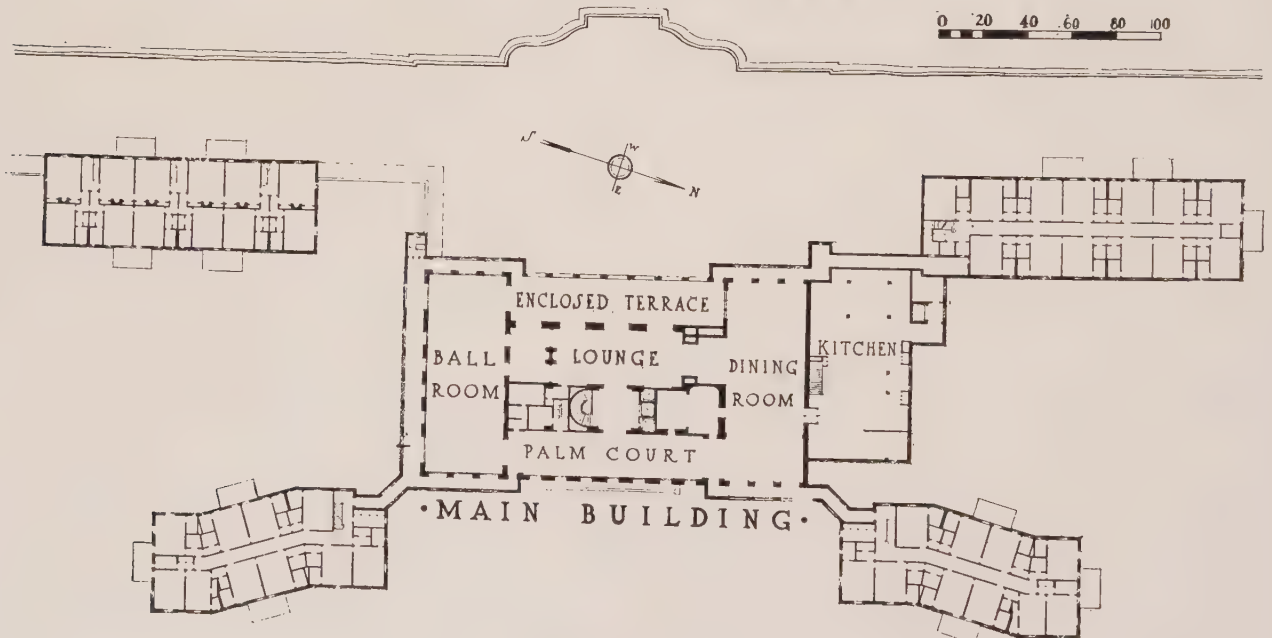
Kenneth M. Murchison, Architect

THE PRACTICAL REQUIREMENTS



View from the East

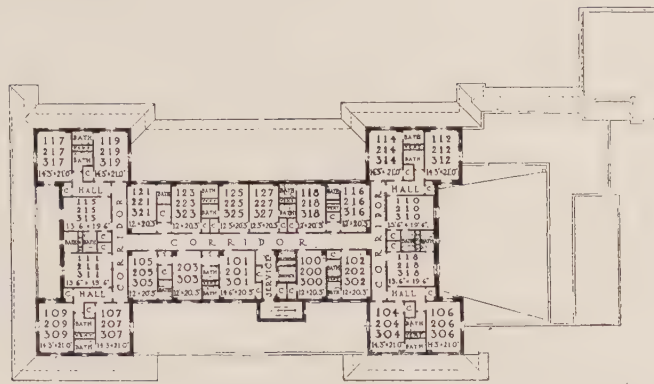
• CHEYENNE LAKE •



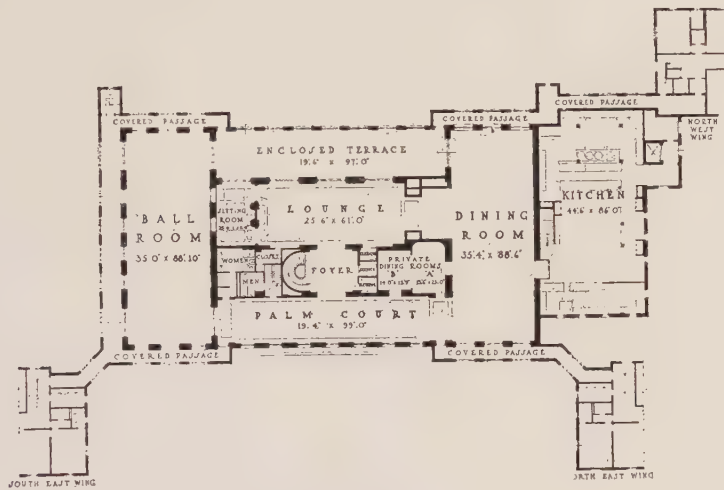
Ground Floor Plan

The Broadmoor Hotel, Colorado Springs, Colo.
Warren & Wetmore, Architects

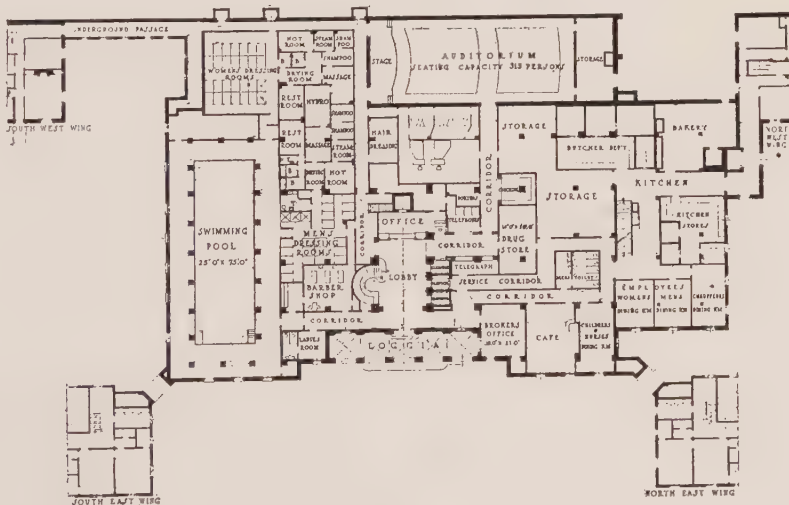
OF MODERN BUILDINGS



Plan of First to Third Floors of Main Building



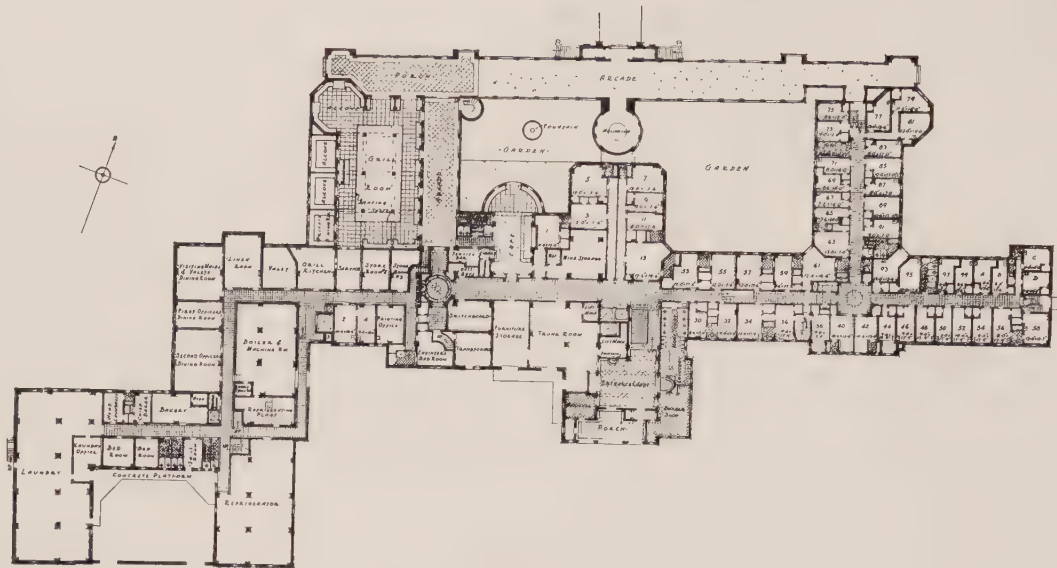
Plan of the Main Floor



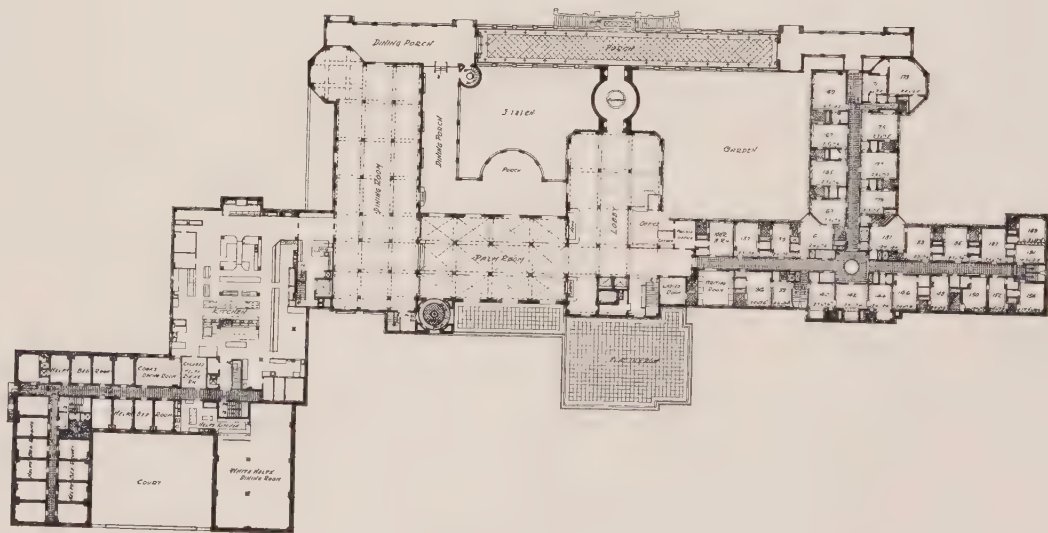
Ground Floor Plan

The Broadmoor Hotel, Colorado Springs, Colo.
Warren & Wetmore, Architects

THE PRACTICAL REQUIREMENTS



Ground Floor Plan



Typical Floor Plan

The New Colonial Hotel, at Nassau, Bahama Islands
Kenneth M. Murchison, Architect

lobby having been kept low in order to secure a homelike effect. The dining room is at the west of this room, and at the same level. John and Laurence Scaschatti were the architects of the Belvedere.

Hotels for those who are travelling for pleasure and demand the highest type of accommodations, and resort hotels for people of the same class, form another big group, and a distinct type of architecture for these hotels has developed. While hotels of the tourist and resort type vary considerably in design, there are certain characteristics of plan that have become more or less standard.

Characteristics of this type are apparent upon an examination of the plans of the Bon Air Vanderbilt Hotel at Augusta, Georgia, Willis Irvin and McKim, Mead & White, architects; the New Colonial Hotel at Nassau, Bahama Islands, Kenneth M. Murchison, architect; the Imperial Hotel, Tokyo, Japan, Frank Lloyd Wright, architect; and the Broadmoor Hotel, Colorado Springs, Colo., Warren & Wetmore, architects. For one thing, they all show bathrooms between the rooms, with private halls connecting adjoining rooms, a quite different arrangement from that in the city

hotels we have been considering. This makes for convenience in renting the rooms *en suite*, it gives flexibility, and in a high class resort hotel or good tourist hotel the outside location for the bathroom can be afforded because, in the first place, the ground area is not so limited as it is in the city and in the second place the whole thing is done on a more liberal scale of expenditure. The requirements for the public rooms of hotels of this class bring about a degree of similarity also.

While a commercial hotel or a city hotel of the usual type does not require a distinctive exterior treatment, individuality of appearance is an asset in a tourist hotel or resort hotel. People who are travelling for pleasure do not want to find each hotel a replica of the last one they stopped at, particularly when they have travelled a considerable distance. They naturally expect to see something different, something that fits into its surroundings and that reflects the character and the traditions of the locality. The resort hotels illustrated here show a degree of variety in architectural treatment that is as wide as their distance one from the other, and that is appropriate to the location in each instance.



The New Colonial Hotel, at Nassau, Bahama Islands
Kenneth M. Murchison, Architect



Dining Room



Lounge

The Essex Club, Newark, N. J.
 Guilbert & Betelle, Architects

CHAPTER VII

CLUB BUILDINGS

A WELL-PLANNED club, of moderate size, that may be taken as an example of the working out of the main requirements of this type of building is the Essex Club, Newark, N. J., Guilbert & Betelle, architects. The photographic view of the façade of this building on this page shows the dignified and pleasing architectural character suitable to a club of this kind, while the plans on page 126 and page 127 give a good idea of the lay-out of the various floors.

It happens that this club is used mainly during the day and particularly at lunch time. Its members are chiefly business men who have their offices in Newark and live in nearby cities to which they usually return at the end of the business day.

In the case of a club differently located, the members may use the club's facilities largely in the evening. Some clubs have many members who remain at the club overnight frequently. Other clubs have little use for bedrooms.

Then, too, there are many special clubs, made up of devotees of some sport, such as yachting or tennis, and other clubs, the membership of which is confined to men in some one line of business or some one profession.

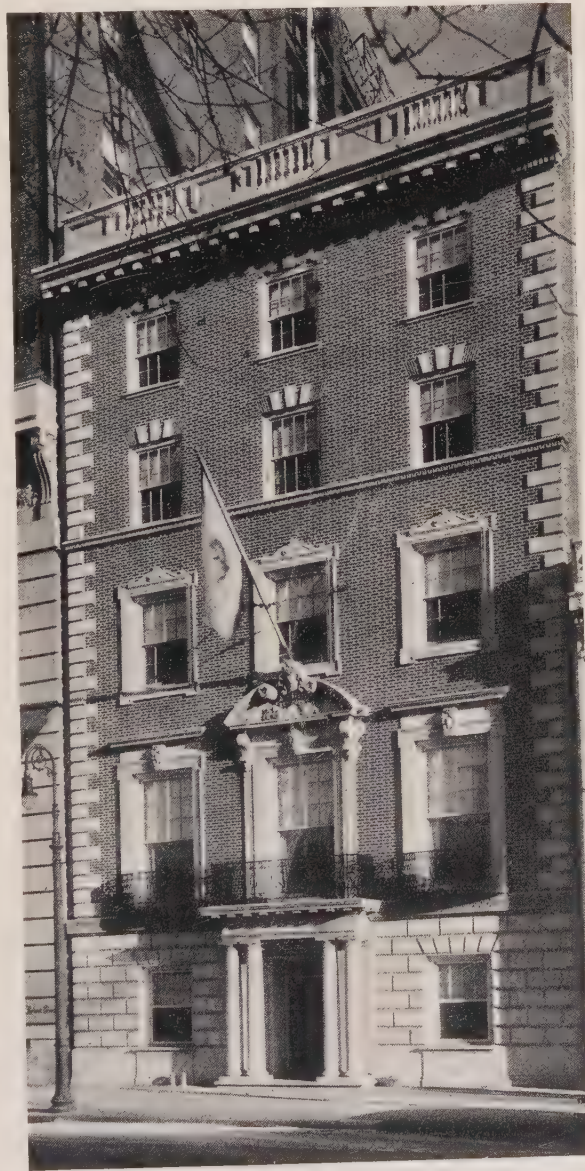
A moment's thought upon these known facts will make clear the impossibility of stating the requirements of clubs in general any more definitely than by saying that a club needs at least a general room or lounge

of sufficient size to comfortably accommodate the greatest number of members and guests ever likely to be at the club at any one time. That this room should be well decorated and should be furnished in a dignified and comfortable manner, with large easy chairs, small tables, etc., and that it should be provided with suitable electric lights, to make reading easy, may be taken for granted.

There should be a library, enough bedrooms

to meet the needs of the members who may wish to stop overnight at the club or to put up a friend. There should be smaller social rooms, perhaps card rooms, and, usually, most important of all, a dining room served by a well-planned and well-equipped kitchen.

In some cases a swimming pool may be wanted, or a billiard room. Private dining rooms may be required and perhaps a handball court or other means of exercise. The Essex Club has a squash court at the top of the building; adjoining the squash court is a small lounge, furnished with wicker chairs, etc., in which members may rest after playing. There are showers here, and dressing rooms for the convenience of members who may wish to change into evening clothes. A club may be regarded as a small hotel for the use of members only, with few or many added features. It should be practical in plan and equipment, pleasant, substantial and dignified.



The Essex Club, Newark, N. J.
Guilbert & Betelle, Architects

THE PRACTICAL REQUIREMENTS

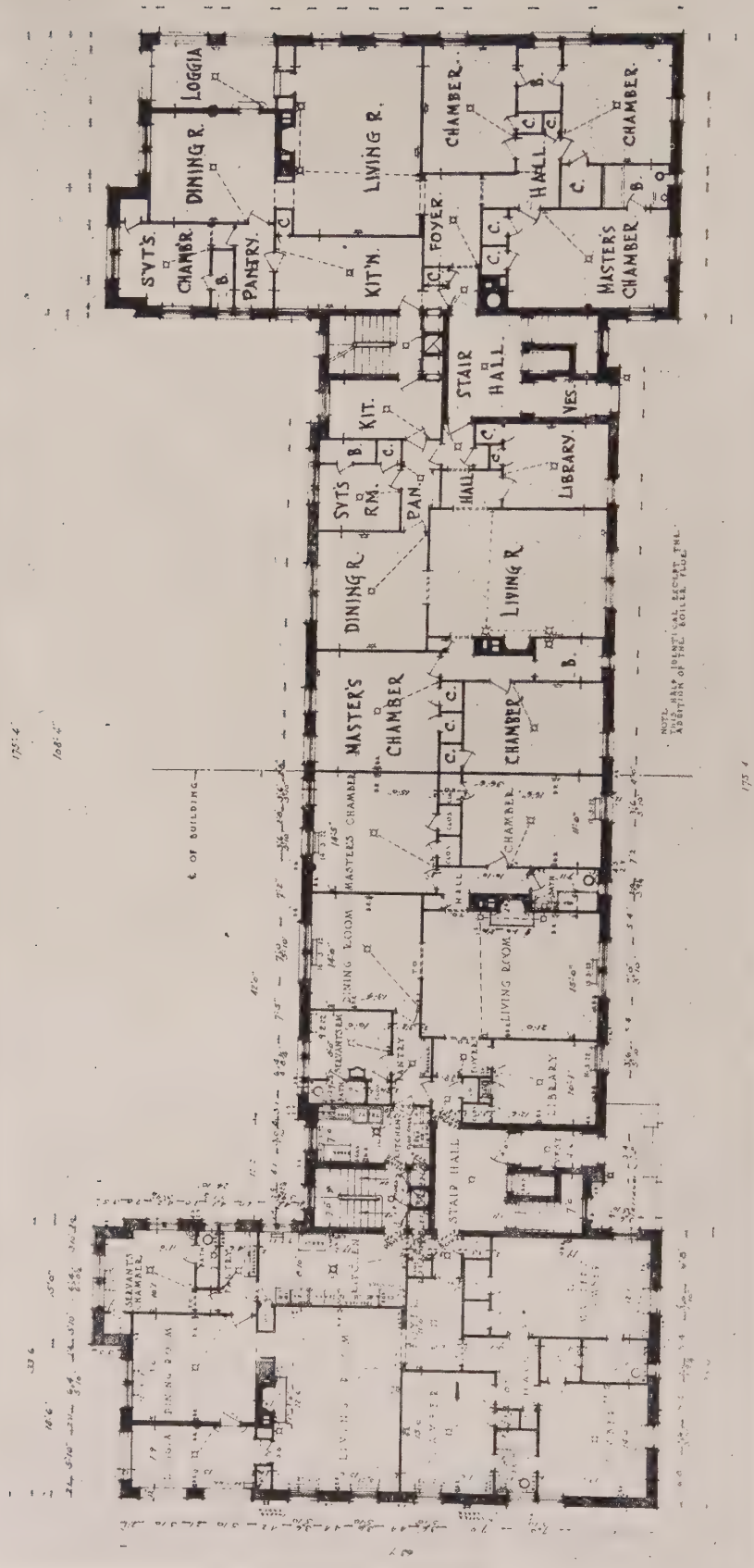


Floor Plans, The Essex Club, Newark, N. J.
 Guilbert & Betelle, Architects

OF MODERN BUILDINGS



Floor Plans, The Essex Club, Newark, N. J.
Guilbert & Betelle, Architects



Entrance Floor Plan of Proposed Apartment House to be Built in Westchester County
 Andrew J. Thomas, Architect

CHAPTER VIII

APARTMENT HOUSES

THERE are as many kinds of apartment houses as there are kinds and conditions of people and, furthermore, each city and each neighborhood has its own more or less distinct type. If an apartment house is not of the right type to meet the needs of the people in the location in which it is built it is not likely to prove profitable. Therefore, the local requirements need to be studied very carefully in every instance.

As a rule the apartment houses in any given section of a city are very much alike, at least this is true of those of approximately the same date. This comes about naturally enough, for people whose circumstances and manner of life are similar tend to group themselves together in neighborhoods and, their requirements being similar, their homes are similar.

It seems to be a safe rule to adhere to the local type of plan and exterior treatment, at least in a general way, in apartment house design. To do this consistently would bar all progress, however. Fortunately, people often do recognize the value of a type of apartment house that is new to the neighborhood, if it is really an improvement over the kind to which they are accustomed. So, progress is made, though more or less slowly. The character of the apartment houses in a section is more likely to change through the invasion of the section by a different class

of people, often by those in better circumstances, than through the building of improved apartment houses for those already in the section.

Under these circumstances there is no advantage to be gained by discussing briefly here the innumerable local types of apartment houses that have come to be accepted in various cities and various neighborhoods; most of them have only local suitability. But, here and there a big idea

can be found that is of wide significance.

One idea of this magnitude is exemplified in the Campanille that is now under construction on the edge of the East River in the Fifties for the Thomas Holding Corporation, Van Wart & Wein, architects. If the example set by the building of the Campanille is followed by other builders the ugly waste land that lies along the water's edge of Manhattan Island may soon be covered by impressive buildings. The city will actually come down to the water and make full use of its island location.

The Campanille is an apartment of the *de luxe* kind. In the lower part will be a yacht club, and above this will be large duplex apartments, each occupying an entire floor of the building.

The plan of a typical floor of this novel apartment house is shown on page 130. This plan, in its main features, is an adaption to apartment house designing of the arrangement of



The "Campanille" for the Thomas Holding Corporation
on the Edge of the East River,
New York City
Van Wart & Wein, Architects

the New York City house of Mr. Joseph B. Thomas, of the firm that is building this apartment house. The dining room, in the second story, from which one may look out upon the two-story living room, is characteristic of his home, and a very delightful effect it produces.

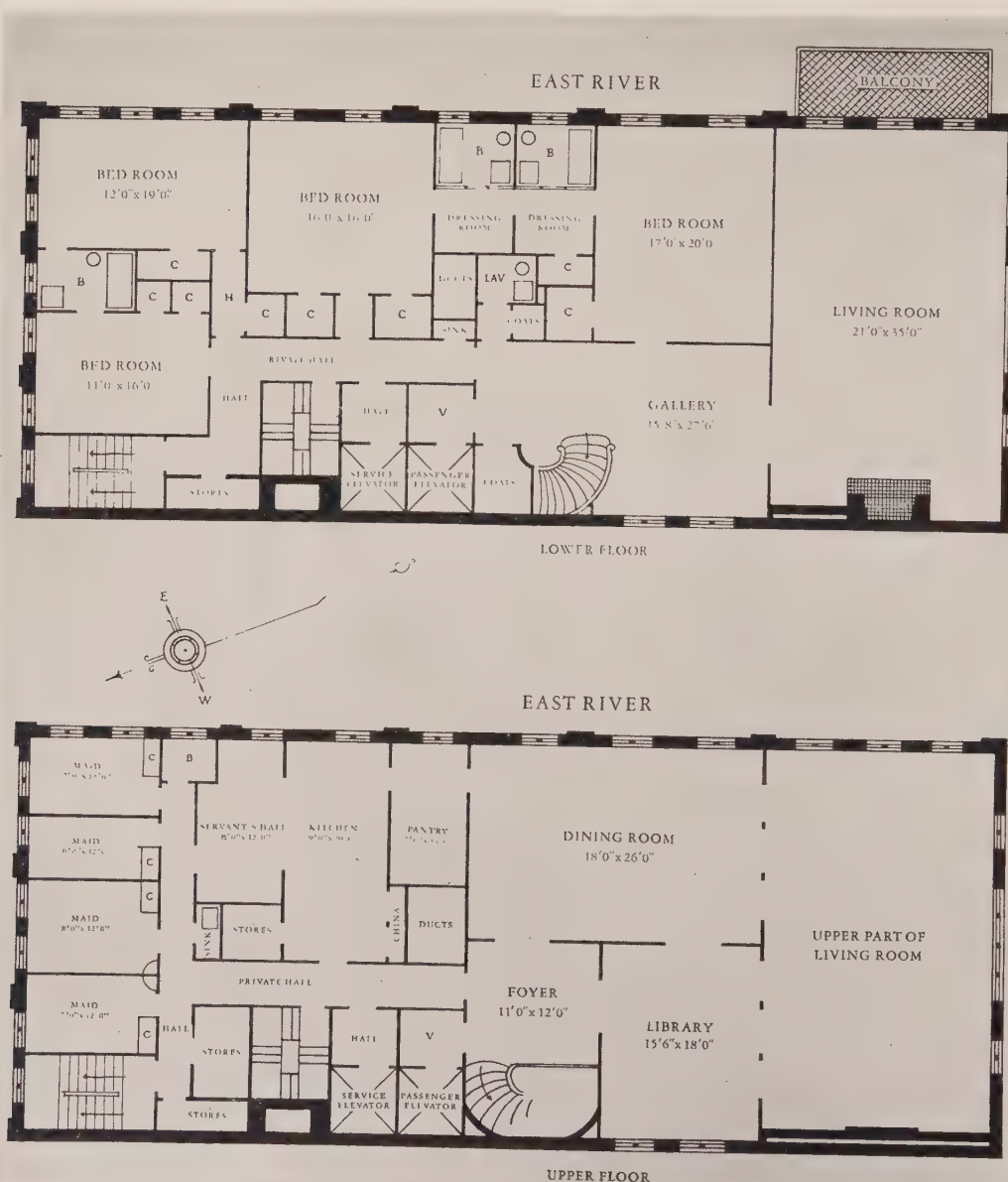
The orientation has been well handled, for the living room extends entirely across the building and faces the southwest so that it gets the sunshine all the year round and the cooling breezes in summer. On the northwest, the side from which the cold wind comes, it has an unbroken wall. Most of the bedrooms have a southeasterly exposure, receiving the early morning sun.

Of even greater significance is the development of the "garden apartment" type which has already made such headway that it has revolu-

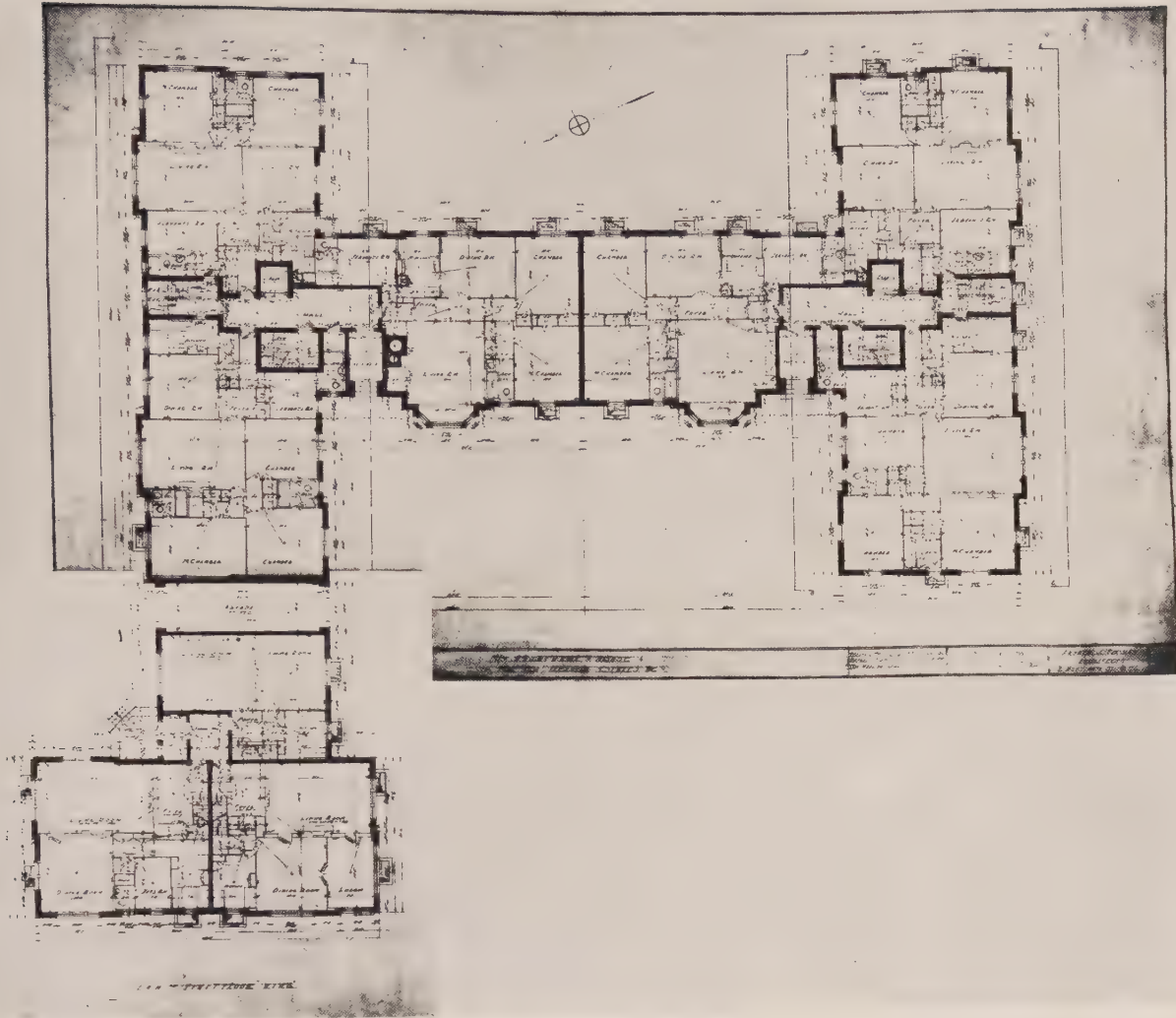
tionized living conditions for large numbers of people, including both people of means and industrial workers.

The basic idea of the garden apartment is the breaking up of the lines of the plan of a suburban apartment house so that it interlocks with the gardening about it and is more like an informal group of buildings than it is like either the older type of high-class apartment house or the familiar row of workmen's houses or flats.

One of the strongest points of this method of planning apartment houses is its ready adaptability to all classes of multi-family housing. The illustrations shown here, of several apartment house developments of this type, Andrew J. Thomas, architect, demonstrate this fact in a striking manner.



Typical Floor Plans, "The Campanille" Apartment House for the Thomas Holding Corporation, New York City
Van Wart & Wein, Architects



Entrance Floor Plan of Apartment House at Scarsdale, N. Y., for the Fox Meadows Estates

Andrew J. Thomas, Architect

The apartment house for the Fox Meadows Estates at Scarsdale, N. Y., is of a very high-class while the apartment house for the North Shore Realty Company at Danbury, Conn., provides housing on the same general principle at moderate rentals.

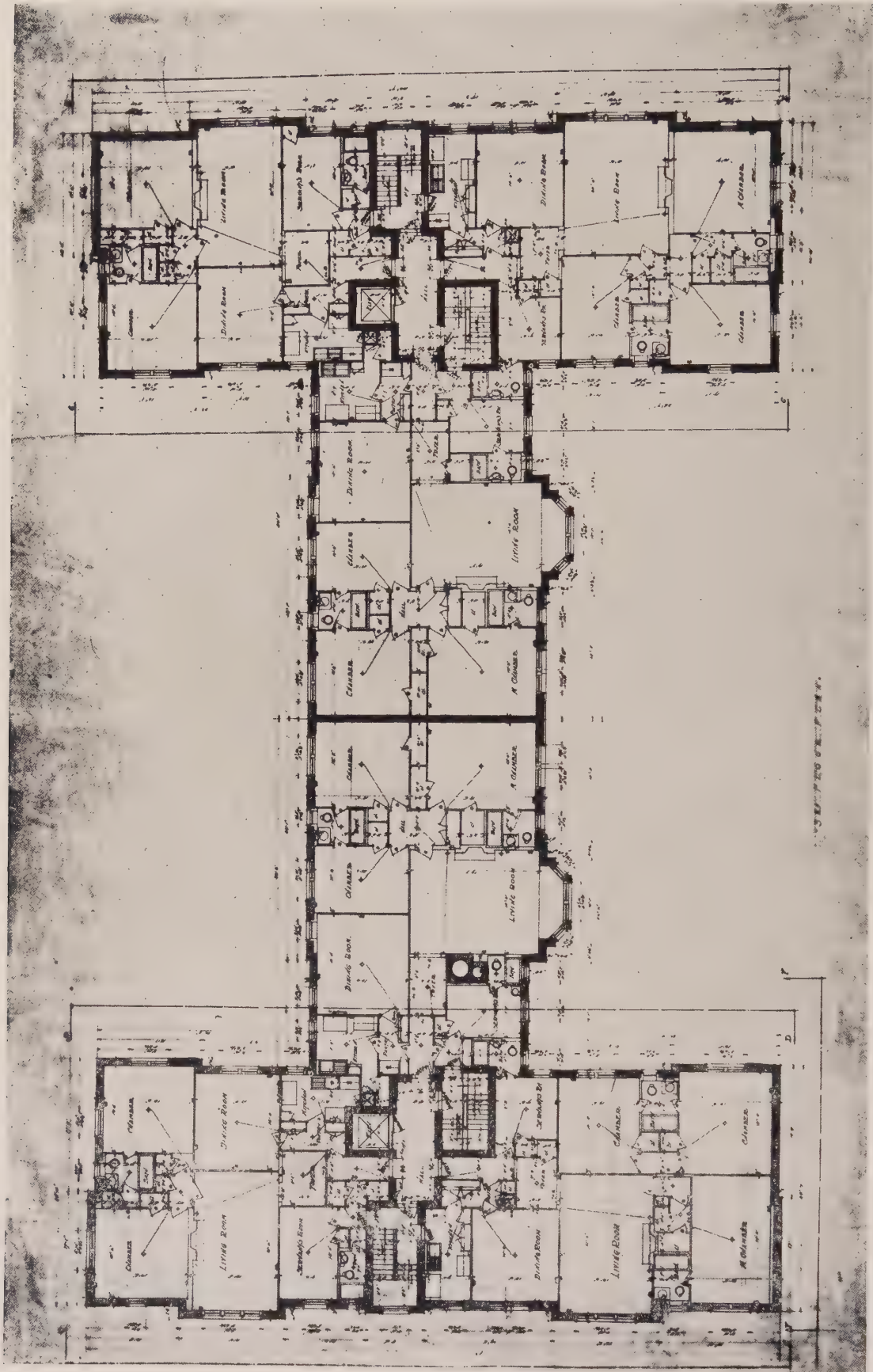
The design for the proposed apartment house in Westchester County, N. Y., which is also illustrated herewith, exemplifies the same principle, but is less extensive; it has very much the look of an English great house while the group for the Fox Meadows Estates has the appearance of an entire old-time town, as may be seen by reference to the perspective drawing at the top of page 133.

In the extreme lower left of the entrance floor plan of the apartment house for the Fox Meadows Estates is a semi-detached group that appears in the perspective on page 133 very much like a big country house. The silhouette of this group is admirably composed, and the massing presents a play of different forms that though very lively

and entirely informal has the necessary coherence.

Another big idea in apartment house design, which has developed so gradually that one hardly realizes the magnitude of the change it has brought about, is the consolidation of the plan. It is only when one turns to the plans of apartment houses built some years ago and sees the waste space in long corridors, the scattered courts that frittered away such opportunities as existed for getting sunlight and air, and the general lack of organization in the plans, that one realizes the value of the compact apartment plans of the present day.

Now the garden apartment idea goes further, it takes these compact apartment units and it pushes one this way and the other that way letting the unoccupied areas of land interlock with the parts of the building and introducing planting. The value of this planting can hardly be overestimated, for it unites the buildings with the ground and adds to the homelike character.



Typical Floor Plan of Apartment House at Scarsdale, N. Y., for the Fox Meadows Estates
Andrew J. Thomas, Architect



Apartment House at Scarsdale, N. Y., for the Fox Meadows Estates

View from Bronx Parkway

Andrew J. Thomas, Architect

Apartments have been growing more and more like detached houses in plan over a long period of years, the compact arrangement of the rooms of a modern apartment is often very much like the arrangement of the one-story cottage or bungalow. The tall living room, that had its origin in feudal times as the great hall of the castle, was introduced some years ago as a feature of the duplex studio apartment buildings, such as the Hotel des Artistes, New York City. Now the char-

acteristics of the detached house have been carried further in the designing of such apartments as those in the Campanille and in the garden apartments illustrated here, particularly in the apartment house group for the Fox Meadows Estates, which is practically an assemblage of houses with the advantages of separate establishments and the benefits of a central heating plant, group service and other conveniences that are characteristic of apartment house life.



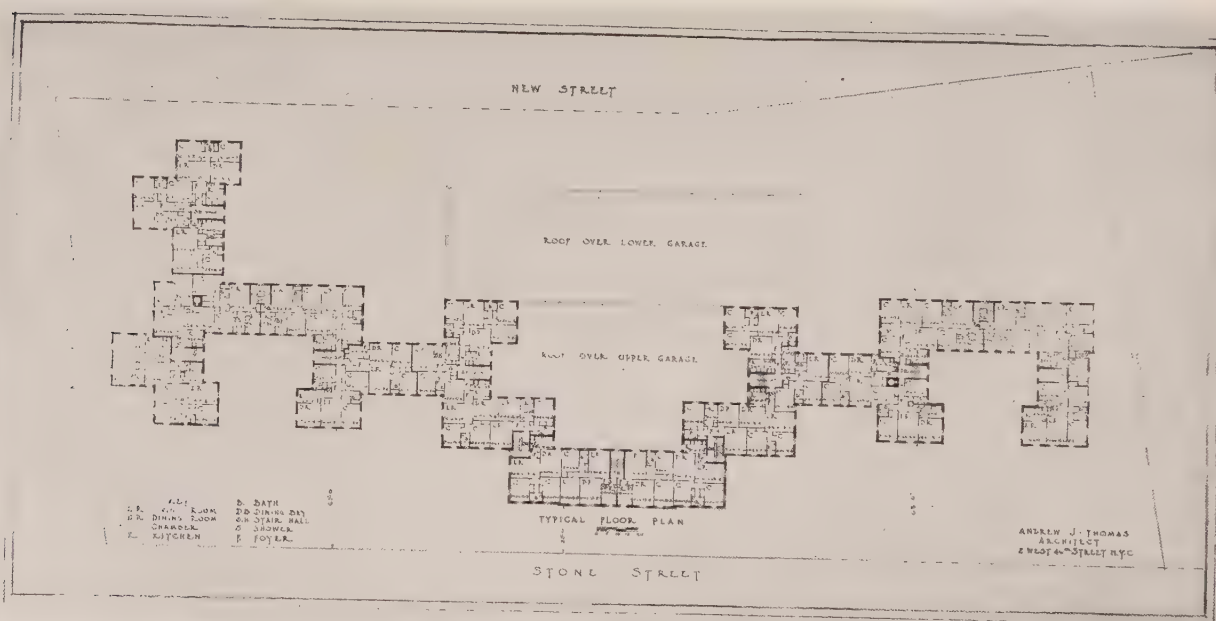
General View of Proposed Apartment House to be Built in Westchester County

Andrew J. Thomas, Architect

THE PRACTICAL REQUIREMENTS

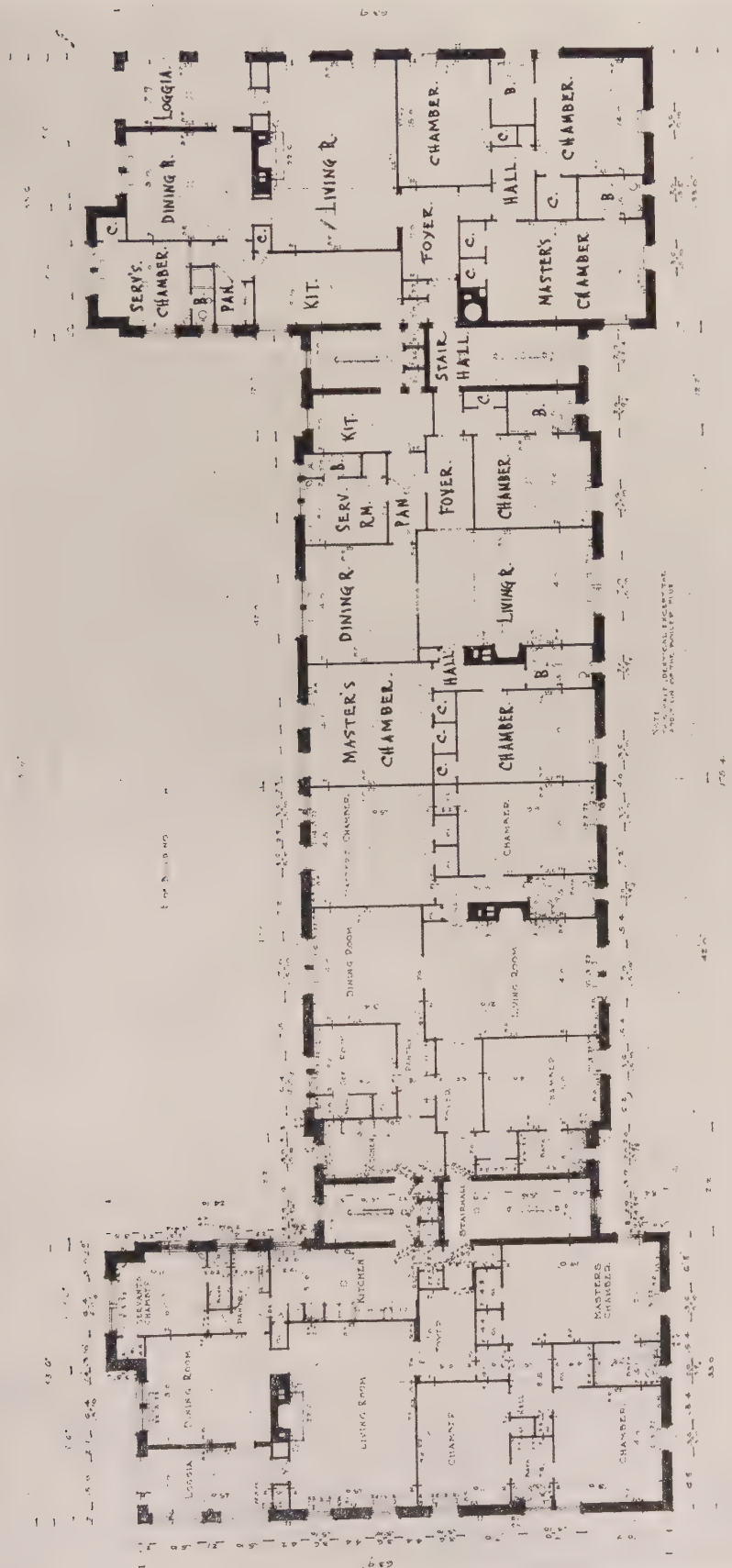


General View

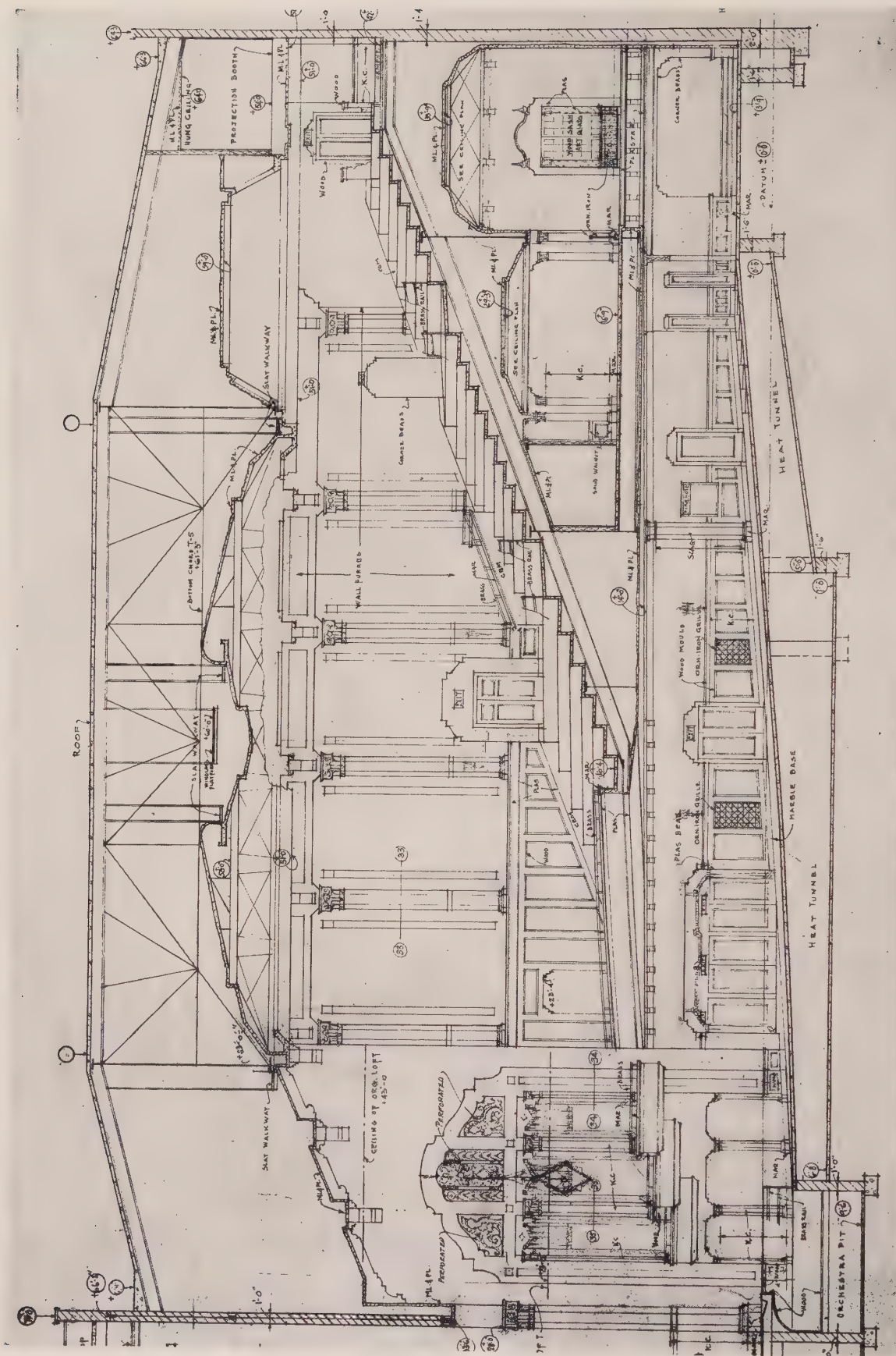


Typical Floor Plan

Multi-family Apartment House for the North Shore Properties Company at Danbury, Conn.
 Andrew J. Thomas, Architect



Typical Floor Plan of Proposed Apartment House to be Built in Westchester County
Andrew J. Thomas, Architect



Section, Motion Picture Theatre, Yonkers, N. Y.
Milton H. McGuire and Eugene DeRosa, Associated Architects

CHAPTER IX

THEATRES AND MOTION PICTURE HOUSES

THE first thing to consider in planning a theatre is the site, to determine which way the theatre is to stand, whether the stage is to run parallel to the street or at right angles to it, also the layout of exit alleys, and of seats, etc., what kind of plan will give the best arrangement. Careful study of these questions at the beginning often results in a much more economical use of the site than is obtained by less systematic procedure. Sometimes this study develops the fact that the site is not well suited for the building of a theatre and the architect must either advise the client that a different site should be chosen or additional land purchased to bring the plot to such size and shape that it will be possible to build a properly planned theatre upon it.

It sometimes happens that the size of the plot does not provide the right space for practical division into blocks of seats and convenient aisles. Theatres are two-aisle, three-aisle or four-aisle houses, usually. The plot may be of such width that if the orchestra floor is arranged on a two-aisle plan, with the central block the maximum fourteen seats wide, there will be only three seats or so at each side and it may, in that case, be better to make it a three-aisle theatre. If the theatre is placed so that the side of the stage is towards the street, it may be possible to extend the balcony over a part of the exit alley, the practice applicable in such a case to secure the re-

quired safe exit for the audience being observed.

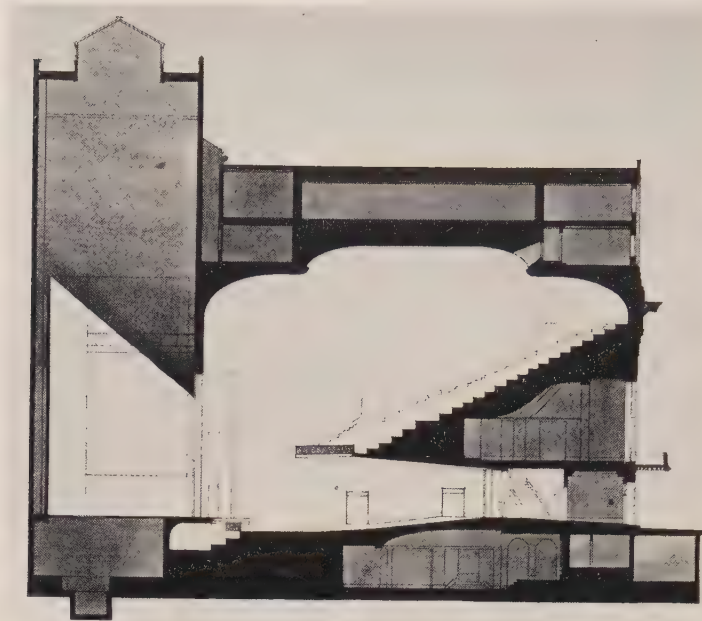
It is very important for the architect to take up with his client, at a very early stage in the work, the matter of insurance and to have the client's insurance brokers look into their side of the problem, perhaps referring the client and the architect to an insurance engineer for advice. There are many small matters that make a great difference in the insurance charges. It is possible, by watchfulness, to reduce these charges very much below what they would otherwise be. This can be done largely by attention to the "cut-off," sprinkler and standpipe requirements. The cut-offs must consist of walls of prescribed construction with no penetrations or with proper automatic fire doors or other approved automatic means of closing such penetrations as are permitted.

The most important of the cut-offs is the proscenium wall, the wall that divides the stage section from the auditorium and entrance sec-

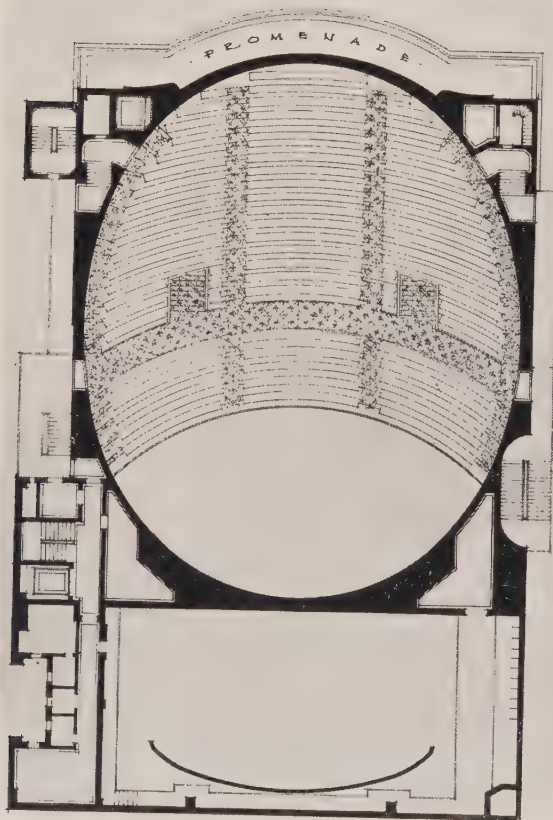
tions of the theatre. The proscenium wall must extend from the foundations to and through the roof, without openings above the ground floor. On the ground floor, at the stage level, there may be two openings in the proscenium wall, at the side of the proscenium opening, each provided with two automatic fire doors. Usually the one of these fire doors that is on the auditorium side of the opening automatically swings shut after a person passes through, while the fire door on the



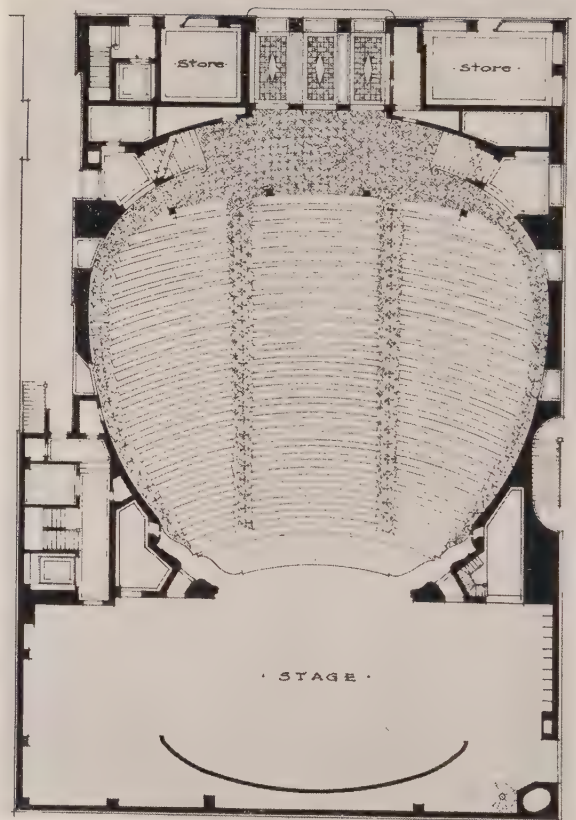
The Ziegfeld Theatre, New York City
Joseph Urban, Architect, Thomas W. Lamb, Associate



Section



Balcony Plan



Orchestra Plan

The Ziegfeld Theatre, New York City
Joseph Urban, Architect, Thomas W. Lamb, Associate

stage side of the opening is self-closing, but is normally held open by a rope having a fusible link that melts in case of fire, thus releasing the devices for closing the door.

There may be three openings in the proscenium wall at the basement level. One of these at either side of the stage and one in the center. Each of these openings must be protected by two fire doors of prescribed type.

In the top of the stage house there must be a ventilator that is normally closed. It is held shut by a rope that runs down to the stage level near the prompt desk. Here hangs a knife with which to cut the rope. Being of hemp, this rope would burn in any case, but, as an additional precaution, it is provided with a fusible link. When this rope is severed by the knife, by the melting of the fusible link or by the burning of the rope, it releases the flaps of the ventilator which fall open allowing the smoke to escape.

The proscenium opening is provided with a fireproof curtain, usually of asbestos cloth. This curtain slides in fireproof slots of prescribed construction and it is hung in such a way that when a hempen cord is severed through the melting of a fusible link, or by the burning or cutting of the cord, the curtain descends of its own weight, closing the proscenium opening. In addition to these precautions not only the stage but the dressing section and the cellar of the stage are fully equipped with sprinklers automatically set in operation by heat. There is, furthermore, the standpipe system which covers the entire building. The standpipe equipment must conform to the requirements of the fire department, the building department and the underwriters. Usually there is one standpipe at either side of the stage and one in the dressing room section, and one at either side of the auditorium. If the auditorium is unusually large, two standpipes at each side of the room may be needed, making a total of four in the auditorium. Standpipes must be provided, in any case, close enough together so that every part of the building may be reached by a stream from a hose of prescribed length attached to some standpipe, in accordance with the regulations. There must be an outlet on each floor or tier with hose attached. Each standpipe must extend through the roof.

Care must be taken to see that sufficient space is allowed in the basement for the pumps and tanks of the sprinkler and standpipe systems, as they take a great deal of room.

There must be a water tank on the roof also, as these systems must be provided with two sources of water supply, a tank on the roof and the pumps and the tank in the cellar. In passing, it is well to note that the boiler room must be kept out from under the theatre, usually it is under an alley. In some cases it may be in the basement of a part of the structure not used for the purpose

of the theatre (stores for instance), but not when this placing brings it even technically under the theatre.

Oversights, that bring heavy penalties from the fire underwriters and sometimes are violations of the law, are very likely to occur in connection with the proscenium wall. For instance, if a vent duct passes through this wall into the auditorium, it must be provided with approved automatic dampers to close the opening in the wall in case of fire. There are other danger points such, for instance, as the one that occurs sometimes when space at the side of the proscenium opening, back of the flare or sloping frame, is made use of as part of the off-stage space. Unless this flare is a part of the proscenium wall, that extends from the foundation through the roof, the enclosure of this space must be of such construction that there is no point at which it is less fireproof than the proscenium wall itself, even the horizontal slab over this inclosure must conform to this requirement.

The stage, the dressing rooms, and the cellar under the stage are the places in which fire is most likely to start. A fire rarely has its origin in the auditorium. The aim is to prevent the fire, smoke and fumes from penetrating the auditorium where they would endanger the lives of the audience and damage the decorations. The ventilator at the top of the stage lets the smoke out and it creates a suction so that the smoke and flames do not enter the auditorium.

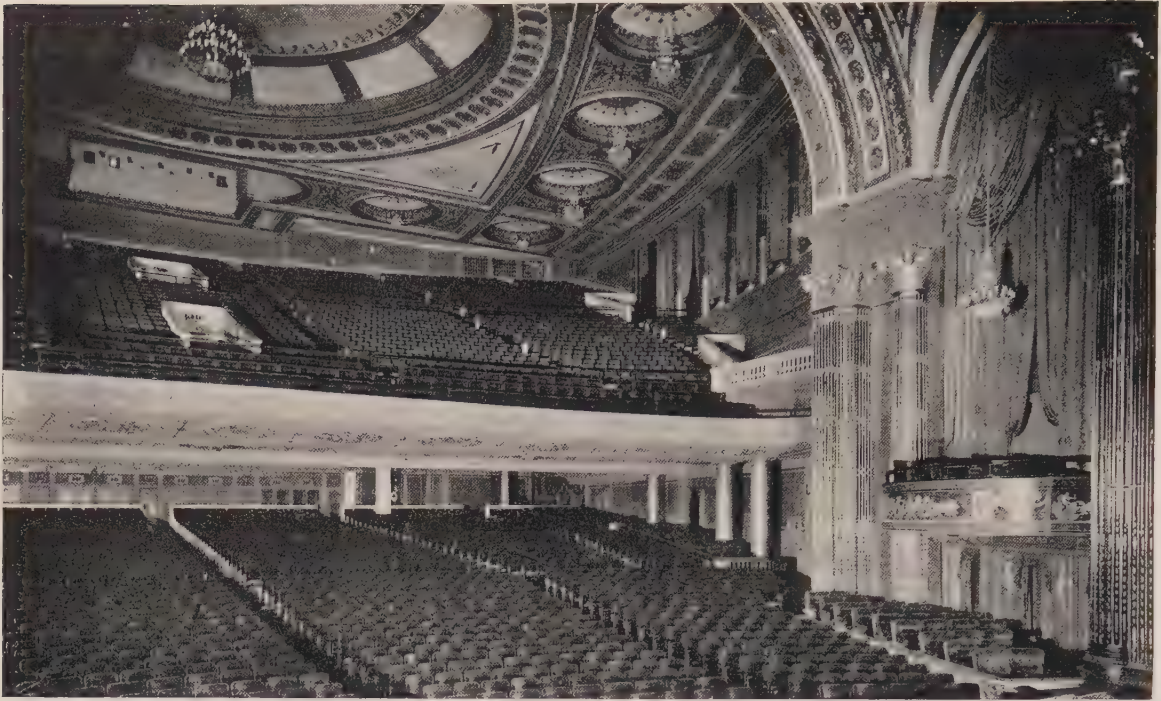
There is a tendency to increase the depth of the stage in theatres for dramatic productions. A clear depth of 30 ft. was formerly regarded as a good standard. This was sometimes shaded to 28 ft. or 29 ft. Now a depth of 32 ft. or even 35 ft. is often obtained where this is possible, as this depth will accommodate a musical comedy or the larger productions.

The width of the proscenium opening varies greatly according to the special conditions but 30 ft. may be taken as a good width. One of the things that influence the width of the proscenium opening is the depth of the theatre. Where the auditorium is broad rather than deep, the sight lines require a wide opening. This may be studied by drawing lines converging to a point on the center of the length of the back wall of the stage, as is the usual practice.

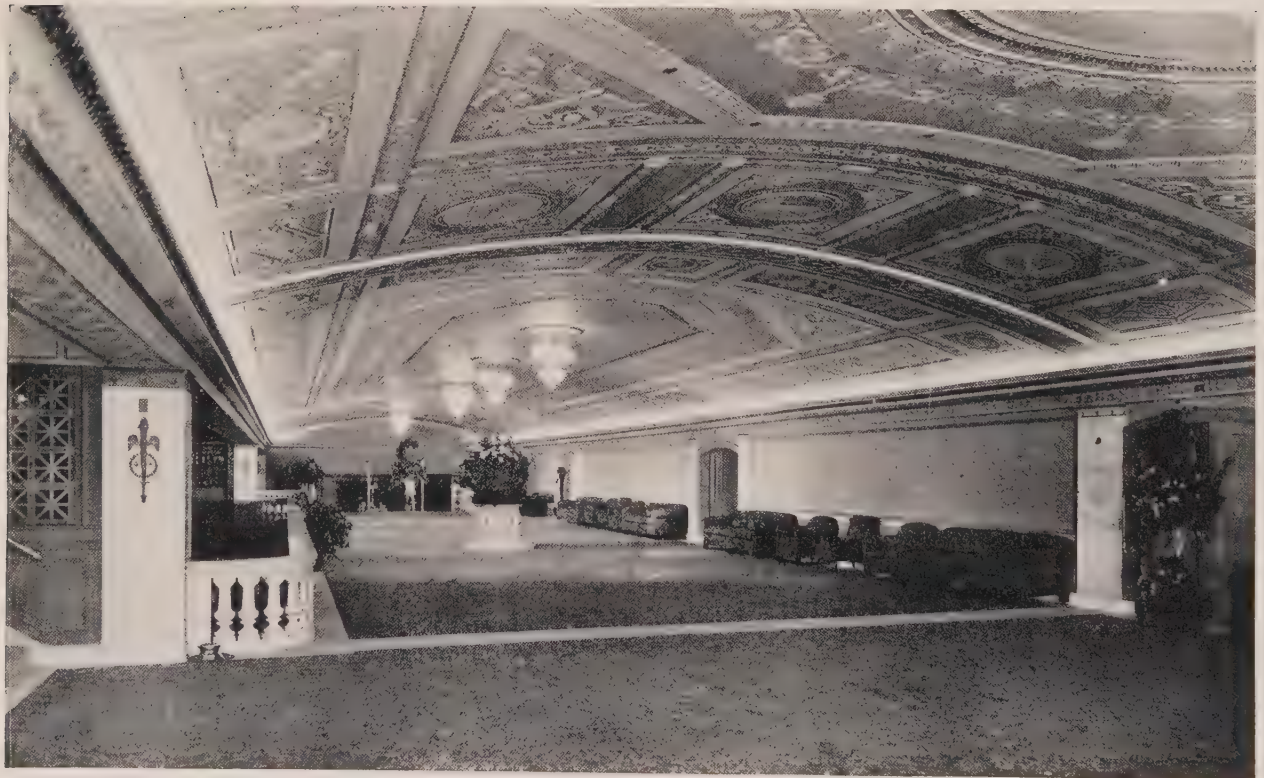
The portion of the stage floor from near the proscenium opening almost to the rear wall is "trapped," meaning that it is so constructed that it may be taken up in sections to form trap doors through which people may come up or go down stairs, etc., in the action of a play.

The off-stage space, the part of the stage floor at the right and left of the part that is in view of the audience, needs to be large enough to accommodate certain scenery and to provide working space. Since the side pieces of scenery are from

THE PRACTICAL REQUIREMENTS



Auditorium of the Capitol Theatre, New York City
Thomas W. Lamb, Architect



Mezzanine of the Capitol Theatre, New York City
Thomas W. Lamb, Architect

4 ft. to 4 ft. 6 in. wide, and there must be a place to walk behind them and to keep objects used in the production, the off-stage space needs to be at least 8 ft. or 10 ft. wide. Fifteen feet is a good width. The rule for the ideal off-stage space is to make it one-half the width of the proscenium opening at each side, but this is not usually possible in a New York City theatre.

It is desirable to have all of the dressing rooms at one side of the stage. Formerly it was the custom to place the rooms for the women at one side and those for the men at the other side. It is more practical to concentrate the dressing rooms in one place and this is commonly done.

Where the dressing rooms are at one side, there is usually less off-stage space on that side than on the other side of the stage.

Often the space all along one side wall of the stage is taken up by the counterbalanced scenery rigging which has largely taken the place of the old-time fly gallery.

The stage switchboard is another thing that takes up a considerable amount of space; it is often 10 ft. or 12 ft. long. Some prefer the switchboard on the stage level, but a more practical arrangement is to put it out of the way in a balcony, say 7 ft. above the stage, with the stage director's table under it. The stage director can then communicate easily with the men who handle the lights. Often the switchboard and director's station can be accommodated back of the flare of the proscenium opening.

It is desirable to have the stage director's station, prompt table, etc., on the same side of the stage as the dressing rooms. The director's table may be on either one side or the other side of the stage. At this station, center all the signals, telephones, etc., for the stage, also the ropes that release the fire ventilator and the fireproof curtain should come down here.

On the auditorium side of the stage curtain, there is another set of problems. In the first place, a good arrangement of seats must be secured and, as well, the maximum of seating capacity consistent with comfort and other requirements.

The balcony has become more important in recent years and the second balcony, or gallery, is not so often seen now. The balcony is often in effect a good floor set back from the stage and allowed to overlap some other part of the building. It is carefully studied for sight lines, etc., and entrance to it is secured very often in a much more pleasant way than formerly. In many theatres, some of moderate size as well as in the new, large motion picture houses, people who have balcony seats now ascend only to part of the height of the balcony, by means of stairs in the halls or lobby, and enter the balcony through vomitories that pierce the balcony from a passage or mezzanine floor. This is a modern application of the old system of vomitories used in ancient theatres,

notably in the Coliseum at Rome. It means for one thing that the seats may be extended all the way to the back wall, instead of leaving a passageway at the back of the balcony, as is the practice where vomitories are not used. This is a gain in seating capacity, for the cross-over upon which the vomitories open is likely to be only 5 ft. wide, as against the much wider passage needed at the back of the balcony, since the latter must be wide enough to carry the traffic of the whole balcony, while each section of the transverse aisle or "cross-over" carries only the traffic to and from a section of seats between vomitories, and thus serves only one-third of the number of people in the balcony, when there are three vomitories. In the case of an extremely deep balcony there may be a second or even a third tier of vomitories, and "cross-overs," see the Capitol balcony on page 140.

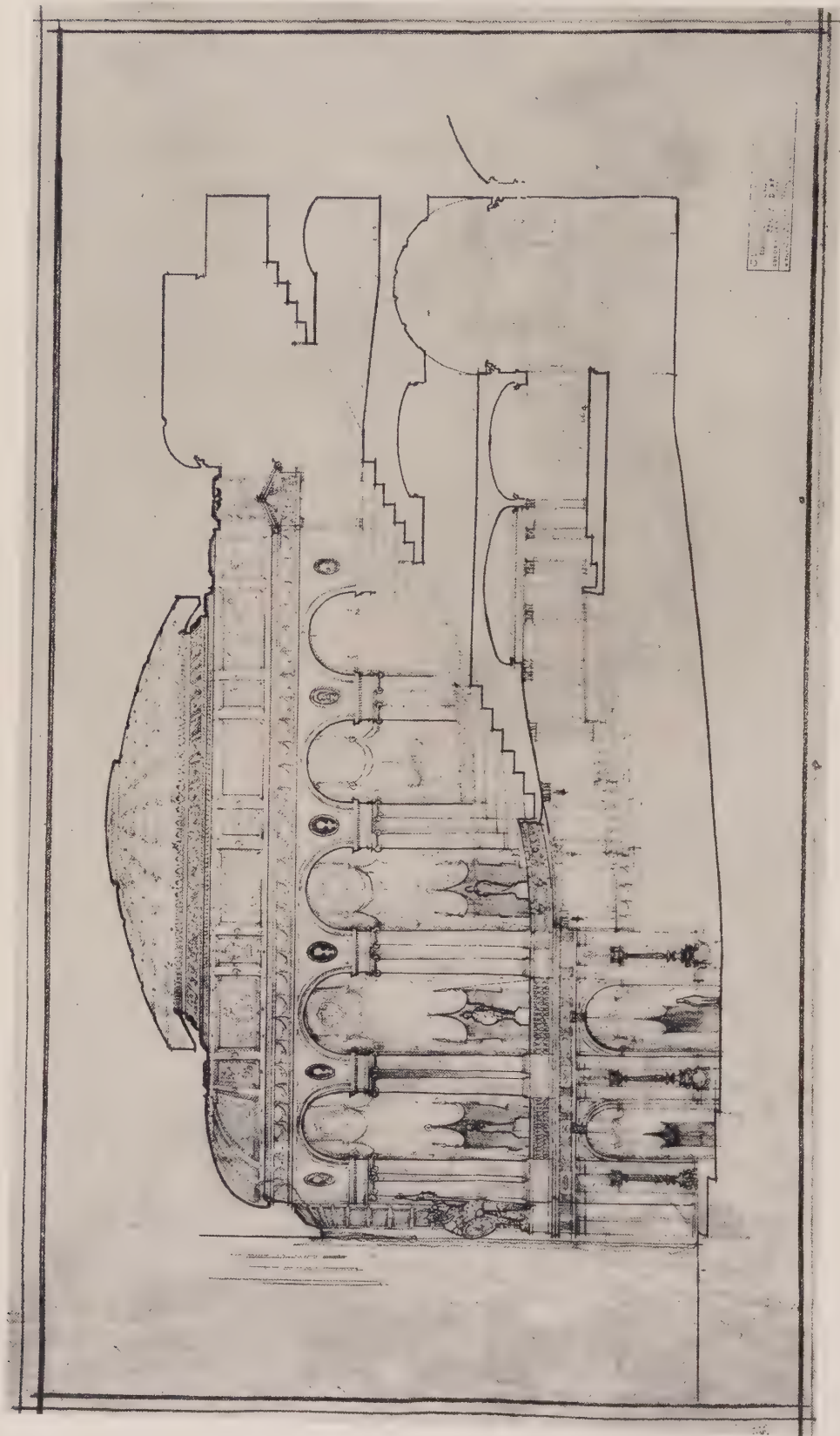
When people enter the balcony from a mezzanine by means of vomitories they do not receive the unpleasant impression that is often given by the view down the long and apparently steep slope of the entire balcony. There is also the practical advantage that only those members of the audience whose seats are above the level of the vomitories need climb further up the aisles, the others go down the aisles to their seats.

The mezzanine and vomitories increase the seating capacity of the balcony by removing the trunk line of the circulation from the back of the balcony. This leaves the space it formerly occupied available for seats. As has been pointed out, the cross aisle, or cross-over and the vomitory heads take much less space in the balcony than a cross aisle at the back.

Vomitories are not always necessary, however, nor are they always regarded as desirable. For example, Henry Miller's Theatre, New York City, drawings of which are shown on pages 153 through 166, has an aisle at the back of the balcony and no vomitories. It also has a second balcony, an unusual feature today.

A satisfactory view of the stage from every seat in the house is, of course, a prime requisite. This is a matter of sight lines and while there are some fixed requirements there must be much give-and-take in arriving at an adjustment between the orchestra floor and the balcony, the necessity for good acoustics and good circulation and good ventilation being kept in mind as well as the visibility of the stage.

It is not necessary that the whole area of the stage, all the way to the top of the proscenium opening, be visible from every seat. An interior set is rarely, if ever, more than 14 ft. to 16 ft. high. If a set is higher than this it runs up into "borders," usually, that do not need to be seen. Therefore, the view is satisfactory if the occupant of a seat can see to a height of 14 ft. on the stage curtain.



Sketch Study, Section of a Theatre
 C. Howard Crane, Architect. Elmer George Kiehler, Ben A. Dore, Associates, Detroit, Michigan

There is a tendency to make the stage lower than it used to be, instead of being 3 ft. 8 in. above the front of the orchestra floor it is now quite often only 3 ft. 4 in. above this level. The object in making the stage lower is, of course to relieve the people in the front rows of seats on the orchestra floor of the discomfort of tilting their heads back in order to see and to avoid cutting off their view of the feet and legs of the actors.

In laying out the sight lines for the balcony it is a good practice to draw a line through the nosing of the balcony steps and continue it until it strikes in the center of the stage curtain at a point not less than 4 ft. below the stage level. This is the minimum; the more below this 4 ft. minimum it is possible to see, the better, say from 5 ft. to 5 ft. 6 in. when other considerations permit.

In laying out the steps or platforms upon which the seats in the balcony are to be set it is well to remember that there must be steps in the aisles, two steps or three steps in the aisle to each step for seats. The steps for seats should be of such height that there will be two steps of comfortable height in the aisle to each seat step. Three aisle steps to a seat step is the maximum permitted, and it is not desirable. The minimum width for seat steps is 32 in. each. The maximum height of seat steps is 21 in. The maximum height of risers of steps in the aisles is 7 in.

With a seat step 32 in. wide and 14 in. high one has usually aisle steps with treads $10\frac{1}{2}$ in. alternating with steps whose width of tread takes up the balance of the width of the seat platform, the risers being 7 in. With the maximum height of 21 in. for seat steps and the minimum width of 32 in. we have, naturally, three risers of 7 in. each in the aisle with treads $10\frac{2}{3}$ in. wide which is allowable, but not desirable.

The idea in drawing balcony sight lines through the nosing of the seat steps and requiring that these lines strike the curtain not less than 4 ft. below the stage level is that 4 ft., and perhaps a little over, is the eye level of a seated person and drawing the lines on the steps is convenient. There are more scientific mathematical processes for establishing sight lines, but this is a simple method commonly used.

While one is planning to provide a good view of the stage for the occupants of balcony seats, the man under the balcony, the man away back by the wall, must not be forgotten. He needs to be able to see a point on the curtain 14 ft. above the stage level. While it is desirable to keep the front of the balcony as low as possible (perhaps as low as 13 ft.) this man under the balcony must not be deprived of his view and, furthermore, he must not be pocketed, so that he cannot hear and so that the ventilation is bad. Therefore, care has to be taken not to extend the orchestra floor too far back under the balcony. The sight lines

should be studied carefully by drawing them on sections and plans of the theatre auditorium.

In planning the seating there are some standard dimensions that are to be kept in mind. For instance, theatre seats are usually spaced 32 in. back to back; this is the minimum permitted. The measurement is taken from back to back, at the seat level, and the line of seats is that of the back standards on the floor. Instead of 32 in. an allowance of 36 in. is made for the first row and the last row of seats, to provide room for the feet of the occupant, in the first instance, and to make room for the inclined back of the seat in the last instance. Where an unusual degree of comfort is wanted, the seats are often spaced 34 in. from back to back instead of 32 in.

The width of theatre seats is usually taken as 19 in. But where this is adopted as a standard width the seats will vary from 18 in. to 20 in. in different parts of the house, in order to adjust the length of the rows to the narrowing spaces between the converging aisles.

After the aisles are laid out and the curves representing the backs of the rows of seats (at the seat level) are drawn and one begins to divide the rows into seats, starting at the back of the house, it will be found that as one goes towards the front it is necessary to provide the same number of seats in rows each of which is a few inches narrower than the row back of it. This is usually done by making the two or three seats nearest to the aisle a little narrower, until a seat has to be omitted from the row.

The persons in seats on the aisle can lean slightly over the aisle and this permits those in the next two seats of each row to lean slightly towards the aisle also. Therefore, they may be comfortably accommodated in seats that are a trifle narrower than the other seats, say 18 in. wide.

The seats in the same theatre frequently vary all the way from 21 in. to 18 in. in width in order that they may be adjusted to the varying length of the rows.

Where unusually comfortable seating is wanted the seats are sometimes made as wide as 24 in., in which case the spacing from back to back should be 34 in.

In tentatively planning the seating, it is customary to allow 8 ft. for three rows of seats and 22 ft. 6 in. for the length of a row of 14 seats, assuming that seats 19 in. wide are to be spaced 32 in. from back to back.

It is necessary to allow 2 in. for the width of the arm of the seat on the aisle. The maximum number of seats permitted in a row is 14 when there is an aisle at each end of the row. The law provides that no more than 6 seats shall intervene between any seat and an aisle. Therefore, when there is not an aisle at each side of a block of seats there can be no more than 7 seats in the row; this applies to the blocks of seats along the

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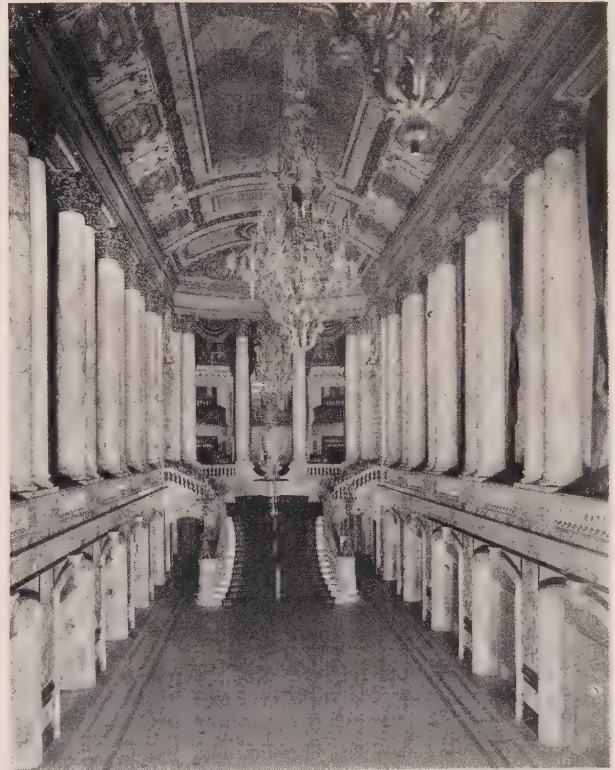
Orchestra of the Paramount Theatre, New York City
C. W. & George L. Rapp, Architects

walls when there is no aisle next to the wall.

The minimum width for an aisle is 3 ft. at the front of the house, increasing as it extends towards the rear. An increase in width of $1\frac{1}{2}$ in. in every 5 ft. may be figured tentatively. There are special regulations determining the width of the cross aisle at the back of the auditorium, but 10 ft. may be regarded, tentatively, as a good width.

In making the first sketch study for a theatre it is well to draw the plot to scale, decide which way the theatre is to run and draw an axis for the center line of the theatre, then allow for the following: thickness of back wall of the stage (say 20 in.); depth of stage (say 28 ft.); fireproof curtain (say 16 in.); apron (3 ft., at least, is required); back row of seats (3 ft.); rail back of seats (say 4 in.); cross aisle (say 10 ft.); wall of entrance lobby (8 in.). Adding these together and subtracting the sum from the depth of the lot gives the length available for rows of seats between the first and last rows already provided for. Dividing this distance by 8 ft. and multiplying the result by three will give the number of rows in this space, and adding the two rows provided for gives total number of rows. An axis should then be drawn across the house at the center of the length of the auditorium and on it should be figured the exit alleys and the wall thicknesses, then the remaining space should be studied for division into aisles and blocks of seats. Such a tentative study will reveal the

possibilities or disadvantages of the plot and of the plan. It will show what parts may be treated more generously and what parts must be reduced, if possible. It will also indicate whether or not the plot is of suitable size and shape to serve as the site for a theatre. The arrangement and the sizes assumed in the example given are intended only to illustrate the principle, not as a solution of any particular problem, of course. In designing a theatre it is highly important that the method of construction to be used be kept clearly in mind from the outset, for otherwise serious changes may have to be made in the design on account of the steel cantilevers and trusses required for supporting the balcony, or other structural requirements. As a typical example, steel drawings are shown on pages 149 through 151 of the balcony of the Thomas Jefferson Theatre, Paterson, N. J., F. W. Wentworth, architect, H. Robins Burroughs, engineer. It will be noted that the balcony floor is supported upon a system of cantilevers and a deep main truss extending from side to side of the auditorium. It will be noted that this truss stops short at either side far enough from the side walls of the auditorium to permit a vomitory along each side wall to pass between the end of the truss and the wall. The ends of this main truss are supported on columns. It will also be noted that the truss is so designed that it has an opening through the center for the central vomitory. This arrange-



Lobby of the Paramount Theatre, New York City
C. W. & George L. Rapp, Architects

ment has been found a satisfactory way of providing access by means of the vomitories of radial passages from the mezzanine floor level to the balcony seats. The steel plan on page 149 shows the method of framing clearly, and it is a method that is widely used. The main truss, marked C 1, extends from side to side of the building, somewhat less than half way back under the balcony. Truss C 4 is supported at one end in the line of the wall and at the other end by attachment to the main truss C 1. Truss C 4 in turn supports truss C 5 which supports truss C 3 and truss C 2, over which the front part of the floor cantilevers. This is a strong, relatively light construction permitting a balcony of great depth. Details of this balcony construction are shown in the drawings on pages 149, 150 and 151.

Since the view obtainable from boxes is usually most unsatisfactory, the boxes have been eliminated in the designing of a large percentage of theatres and "divans" have been developed as a means of offsetting the disadvantages of sitting along the sides of the house and in the rear by making these seats especially comfortable and treating them in a distinctive manner.

Another matter that requires special attention, in theatre design, is that of acoustics, for unless care is taken to study the proportions of the room and the shapes of the various surfaces, very unpleasant surprises may result. For instance, because the curve of the back part of the auditorium was such that sounds originating on the stage and in the orchestra pit were focused on the back drop, from which they were reflected to the

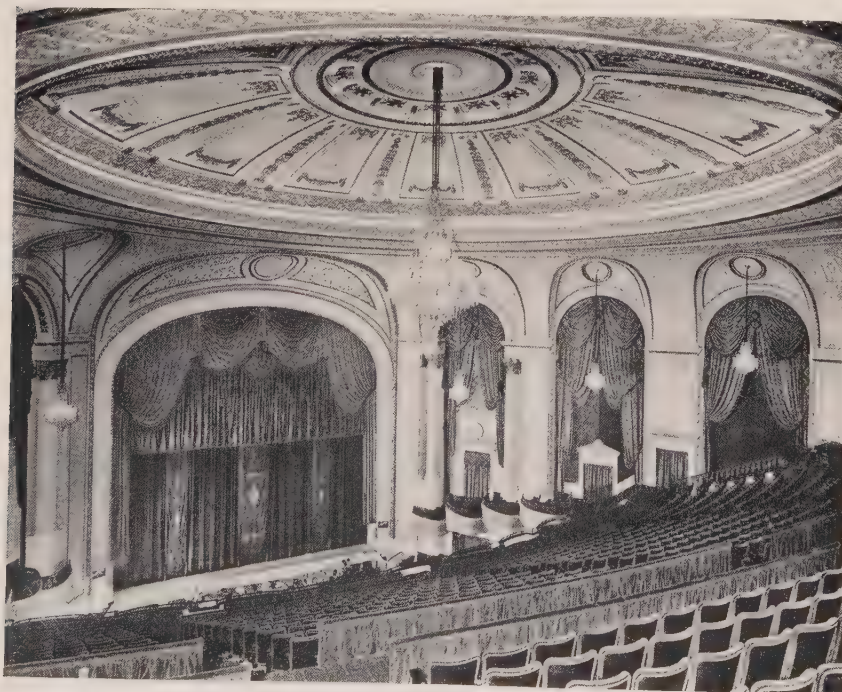


Portion of Auditorium, Paramount Theatre,
New York City
C. W. & George L. Rapp, Architects

back of the house, and again focused at a point on the main floor just in front of the balcony, a "dead" spot was created at that point. This is only one of innumerable cases.

In order to alleviate this trouble it was necessary to hang heavy velvet curtains all around the back part of the auditorium to absorb the sound. In another case, that of a theatre which has a domed ceiling, the dome focused the sound in such a way as to produce a very bad effect. An acoustical engineer was able to partly remedy the condition by having felt placed in the bottoms of the coffers of the ceiling dome. This absorbed the sound to some extent. It is well to note in this connection that breaking up the surfaces of walls and ceilings with moulding and architectural motives that relieve them of plainness improves the acoustics.

In general it may be said that it is important to avoid



Auditorium of the Albee Theatre, Brooklyn, New York City
Thomas W. Lamb, Architect

surfaces of such curvature that they focus sound within the auditorium and that it is desirable to break up surfaces with panels, pilasters and coffers or other irregularities. Also, where there is danger of focusing or of considerable reverberation, it is desirable to form the surface of the wall or of the ceiling of some sound-absorbing substance. When there are no boxes at the sides of the stage, there is danger of a bad acoustical condition unless their place is taken by a sound-absorbing surface. The boxes with their heavy draperies and their occupants absorbed sound very well and the reflection of sound from this point is very likely to cause trouble. Also, when there is no balcony the back wall of the auditorium is likely to need a sound-absorbing surface. People massed together absorb sound admirably; so do heavy draperies hung in deep folds. The omission of the boxes and of the balcony, therefore, deprives the room of one of its best safeguards against bad acoustics and something to serve their purpose must be substituted quite often. The acoustics of any auditorium is a matter that calls for expert counsel.

Of the sound-absorbing materials there are a number of types available including acoustical cast stone in the form of tile, also a ceramic tile that has sound-absorbing properties and an acoustical plaster that is sound-absorbing. Common to all these materials is the continuity of the air cells. This permits sounds to be absorbed instead of reflecting them. By the use of some such material it is possible to absorb a high percentage of the sound. In general, curved surfaces in an auditorium are likely to prove dangerous from the standpoint of acoustics, and need to be carefully studied in order that they may not cause trouble. If the curves are well studied, curved surfaces can be used successfully and even a circular auditorium can be designed having satisfactory acoustical properties, though sound-absorbing materials may need to be depended upon to a considerable extent.

In the course of this chapter an effort has been made to touch the high points in theatre design and to give such details as may serve to indicate the nature of the problems, and the method of their solution. Some of the fixed requirements have been stated for their usefulness in the making of tentative studies. It is manifestly impossible to cover the details of this subject in less space than that afforded by a separate volume at least, but it is believed that such a statement as this, giving "the bones of the thing," has a special kind of usefulness, in that it points the way to getting the most out of the study of plans and exhaustive reference works.

A wealth of detailed information can be gathered from the careful study of the photographs, poché plans and working drawings reproduced as illustrations in this chapter, particularly

the set of drawings of Henry Miller's Theatre, New York City, Paul R. Allen, architect, Harry Creighton Ingalls, associate.

In the designing of theatres, judgment must be exercised to an unusual degree in harmonizing the requirements. The architect must keep in mind constantly the following: fire protection, steel construction, circulation, sight lines, acoustics, ventilation, and stage operation, to say nothing of a number of other matters. He must co-ordinate and adjust these elements in such a way that whatever sacrifices and compromises have to be made are not seriously detrimental, so that the theatre is a safe and satisfactory place in which to see or to stage a production.

There are innumerable features of the theatre, like the projection of motion pictures, that are covered by regulations governing their design and construction. The codes of laws or of rules describe these things as briefly as is consistent with accuracy; these codes are easily referred to and to attempt to embody this kind of information in this chapter would extend it beyond its proper limits and would be aside from the purpose of this book.

As everyone knows, motion picture houses range all the way from the relatively simple neighborhood picture houses to the colossal theatres that are among the marvels of the day. Characteristic views of two of the big theatres are shown here—the Capitol Theatre and the Paramount Theatre, New York City.

The first essential requirement for showing motion pictures in any theatre is a projection booth, to house the motion picture machines. The projection apparatus is in the nature of a highly developed and specialized stereopticon, with reels that cause the film containing the series of pictures to pass between the condensing lens and the front lens. The tube of the projecting lens of this apparatus throws the light upon the screen through a rectangular opening in the wall of the projection booth.

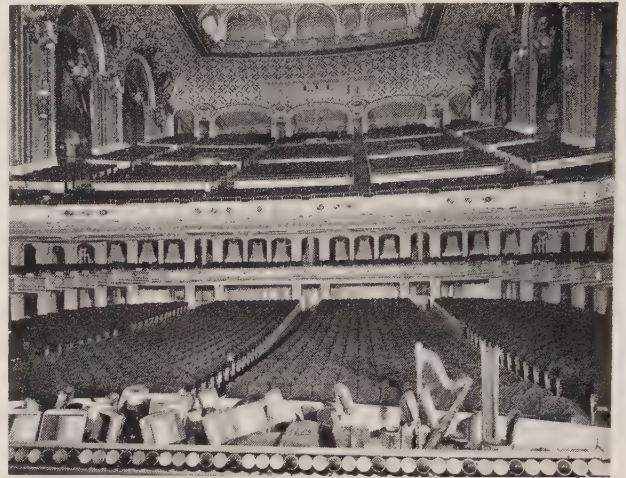
The projection booth should be placed at the back of the theatre directly opposite to the screen and at such a height that the projecting lens is as nearly level with the center of the screen as is practicable. Very often, on account of conditions, the projection booth has to be placed considerably above this level, so that the motion picture machine points downward, more or less, towards the screen. This causes distortion of the picture that is most noticeable in the change of shape of the picture from a rectangle to the form of an inverted keystone. This means that the faces of the actors and all parts of the picture are similarly distorted. Unless this distortion is unusually great it does no real harm, but the appearance of a picture that is out of square is unpleasant. To correct this "keystone" effect, so far as the squareness of the picture is concerned,

a diaphragm with a keystone-shaped opening is sometimes placed in the motion picture machine to counteract the effect of the downward pitch. It merely squares up the edge and, of course, does not lessen in any way whatever distortion there may be in the picture on the screen.

A border or mat of dull black material is sometimes used around the screen to absorb the part of the picture that spreads beyond the edge of the screen.

The keystone effect is due to the fact that when the projection machine points more or less downward the top of the screen is nearer to the lens than the bottom, so the screen is sometimes brought forward at the bottom a little, to correct or minimize this distortion. All of these things are expedients and do not change the fact that the ideal location for the projection booth is directly opposite the center of the screen.

The angle at which the screen is viewed, also, causes noticeable distortion sometimes. A person seated very far at one side and very far forward may find this distortion, which is due to the foreshortening of the picture, so great as to make his view of the picture highly unsatisfactory. For this reason care must be taken not to place seats in these parts of the house. A simple, practical rule is to draw lines at 45 degrees from the corners of the motion picture screen to the side walls of the auditorium, and to keep all seats outside of the triangular corner areas thus formed, as these are the areas in which the foreshortening of the picture just spoken of would be so great as to render the seats practically useless. This is only a rule-of-thumb method, but it serves the purpose for most work. Instead of being used for seats, these areas at the front corners of the auditorium should be used for exits, entrances to stairways, storage spaces, closets, etc. Treated architecturally they make good flanking features for



View of Auditorium from the Stage, Paramount Theatre,
New York City

C. W. & George L. Rapp, Architects

the screen. These areas that are useless for seats do not cut into the seating area of the auditorium very far, usually, because of the fact that there is always the width of some kind of stage, or of a platform for the orchestra between the screen and the front row of seats.

In most theatres the platform required for the other parts of the entertainment keeps the first row of seats back far enough from the screen so that the picture can be seen, but it is well to note the fact that the picture cannot be seen at all well by a person who is less than 12 ft. or 15 ft. from the screen and that a satisfactory view cannot be had if the distance is less than 25 ft. or 30 ft. The chief factor in this has to do with the nature of a picture produced by projection on a screen. Also, the limits of the angle of vision of the eye prevent one from seeing the whole of a picture when so close to it that rays of light from the extreme limits of the picture to the eye have an angle to each other greater than the angle of clear vision, which may be assumed to be 60 degrees, for practical purposes. This latter consideration governs the minimum distance in relation to the size of the picture.

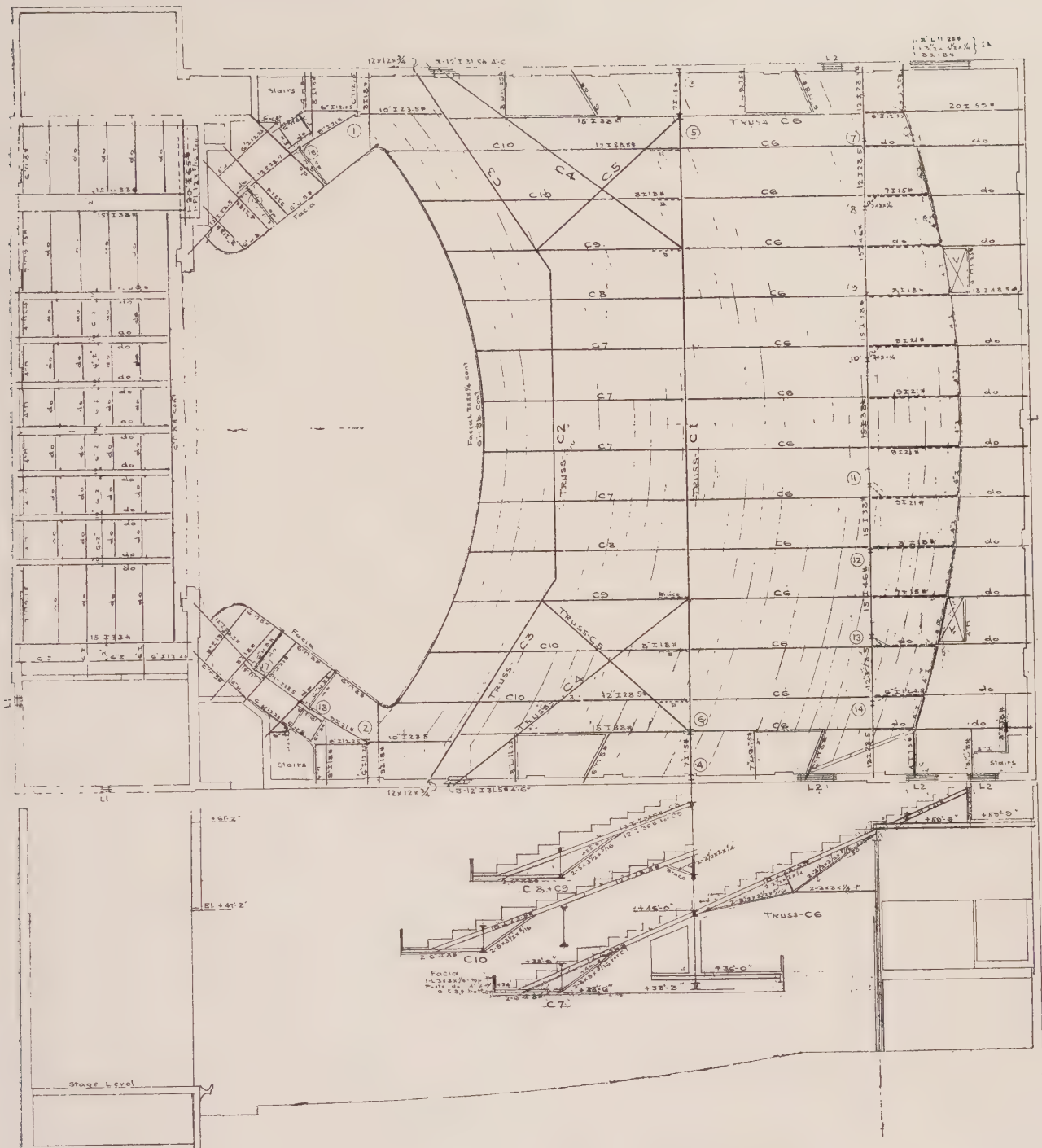
The other requirements are highly variable, the kind of stage or platform, the placing of the orchestra, if any, provision for an organ, etc. In many theatres, even the smaller ones, there is an organ, and the organ blower is frequently under the platform. One of the pieces of machinery frequently used is an electric curtain-operating machine, by which the curtains are drawn apart to expose the screen and drawn together to form a background for the presentation of singers or other entertainment. These details need not be gone into here, since they must be taken up thoroughly with the owner or manager of the theatre that is being designed, in order that his wishes may be carried out. But a word about the screen may not be amiss. The screen is usually



Lounge in the Mezzanine of the Paramount Theatre,
New York City

C. W. & George L. Rapp, Architects

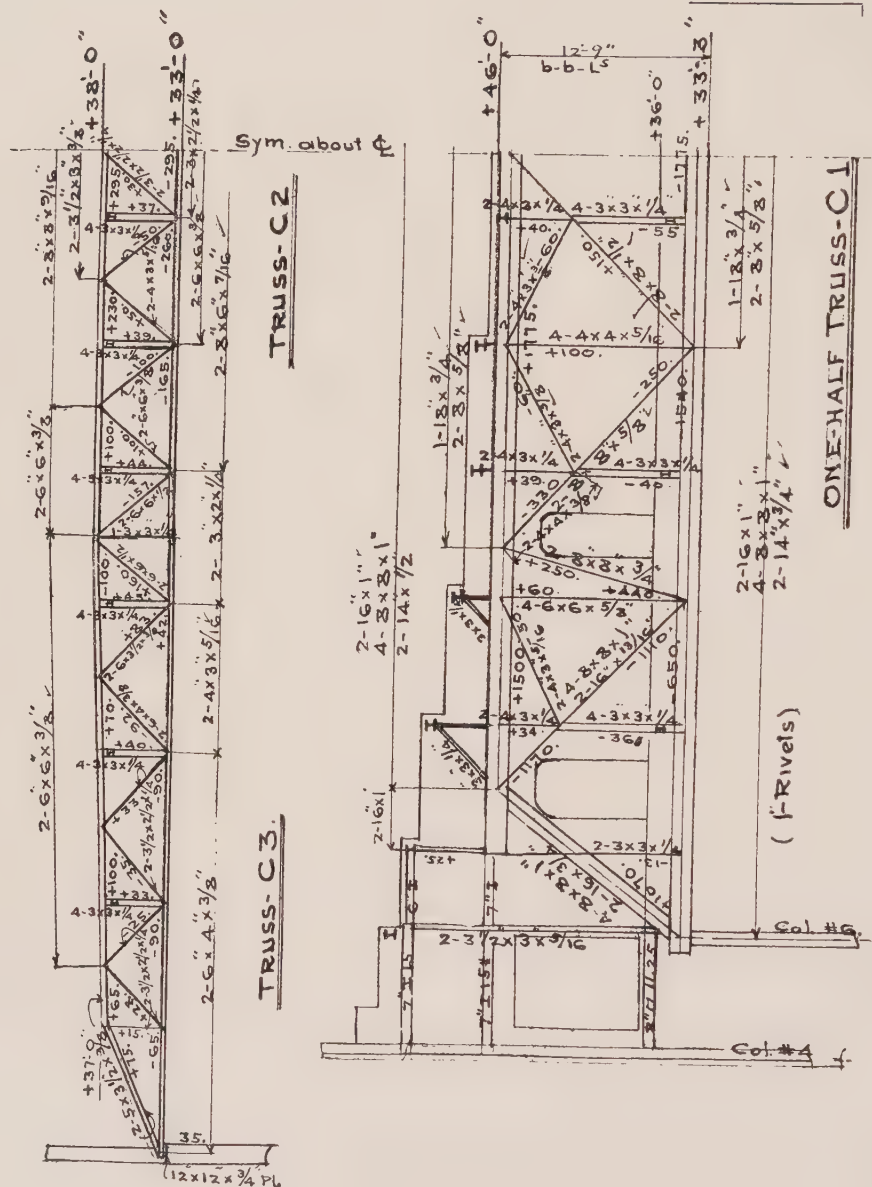
OF MODERN BUILDINGS



Balcony Framing, Steel, Alexander Hamilton Theatre, Paterson, N. J.

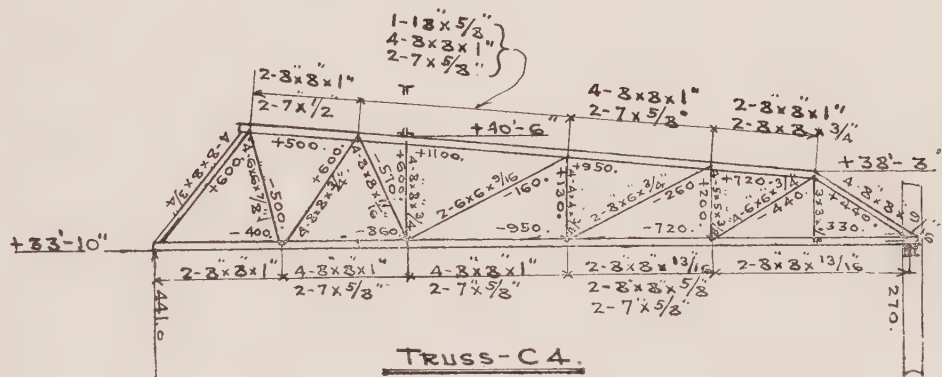
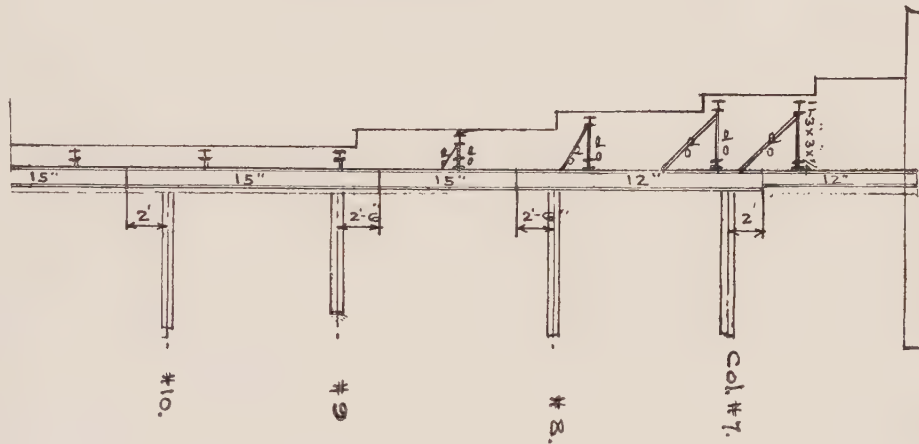
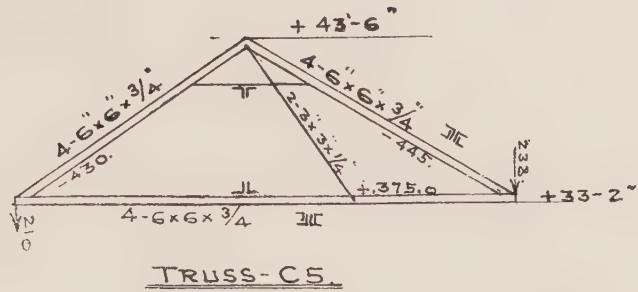
Fred W. Wentworth, Architect, H. Robins Burroughs, Engineer

See details on other pages.



Details of Balcony Framing, Alexander Hamilton Theatre, Paterson, N. J.

Fred W. Wentworth, Architect, H. Robins Burroughs, Engineer

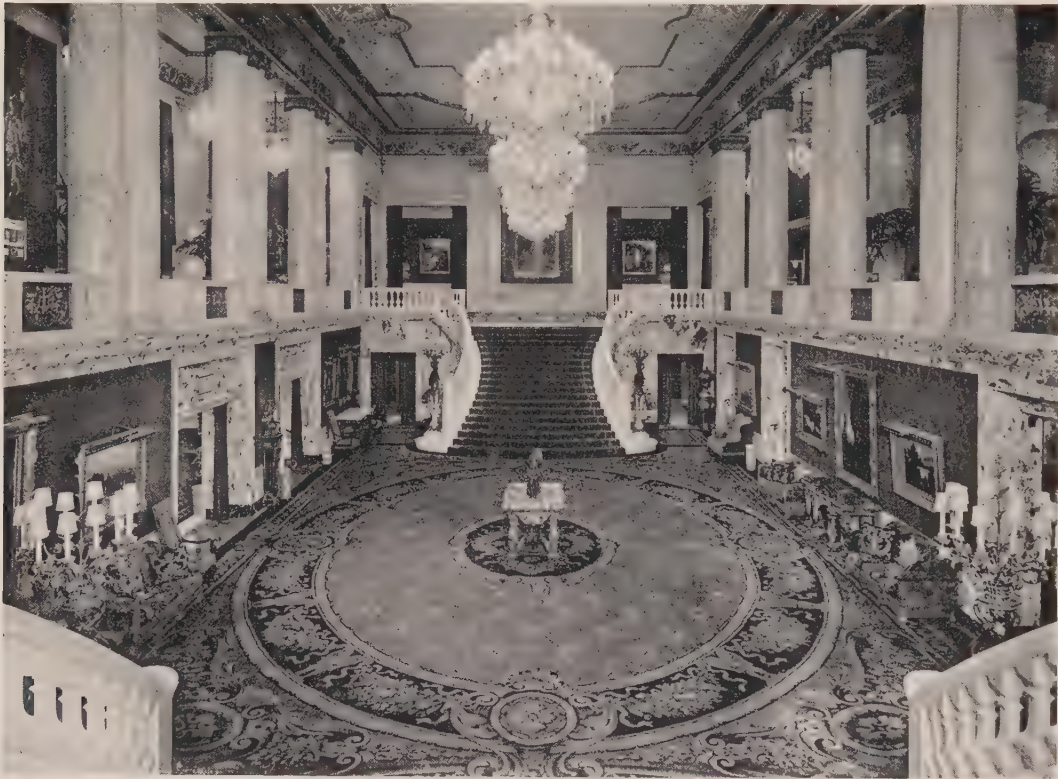


Details of Balcony Framing, Alexander Hamilton Theatre, Paterson, N. J.
Fred W. Wentworth, Architect, H. Robins Burroughs, Engineer

selected by the owner or manager and sometimes he also has it installed. But the architect must provide a place for it, usually. Usually the screen consists of a special kind of cloth, or of cloth treated with a special paint, stretched on a wooden frame. This may be fastened to the wall, or set far enough from the wall to permit people to pass behind it. Sometimes it is hung from above and let down to the stage like a piece of scenery. When the screen is to be fastened to the wall the architect should provide a frame for it, of proper size and suitable design. The wall back of the screen is usually left unfinished.

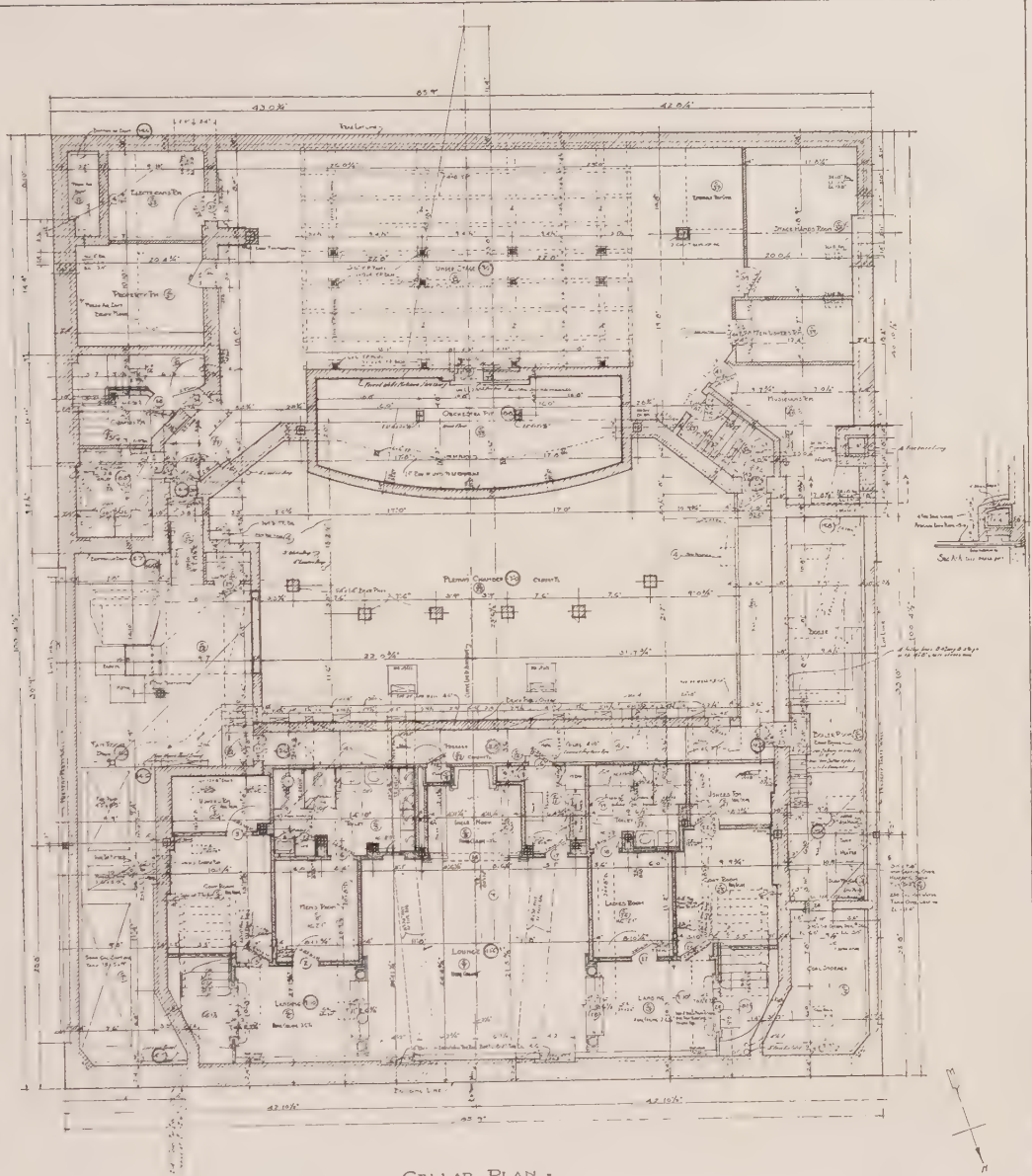
Motion picture screens are about 9 ft. x 12 ft., 13 ft. 6 in. x 18 ft. or in certain other sizes having about the same relation of length to width.

The brief statement given here can serve to indicate only the main requirements that distinguish the architectural problem of a theatre in which motion pictures are to be shown from that of any other theatre, but it provides a basis for the detailed study of the subject of the designing of motion picture theatres and of the special provisions for the showing of motion pictures in other theatres and auditoriums.



Grand Foyer of the Albee Theatre, Brooklyn, New York City

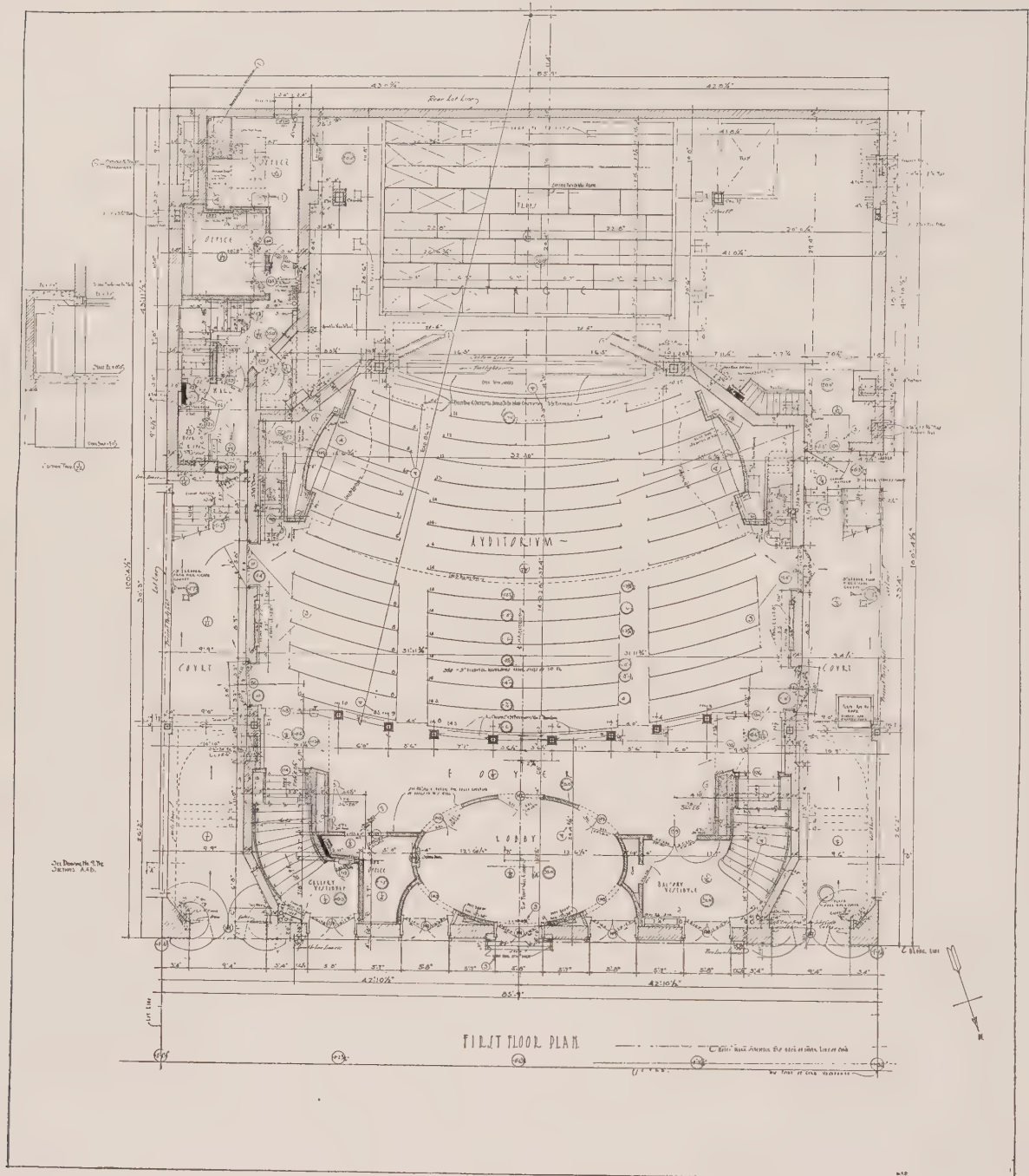
Thomas W. Lamb, Architect



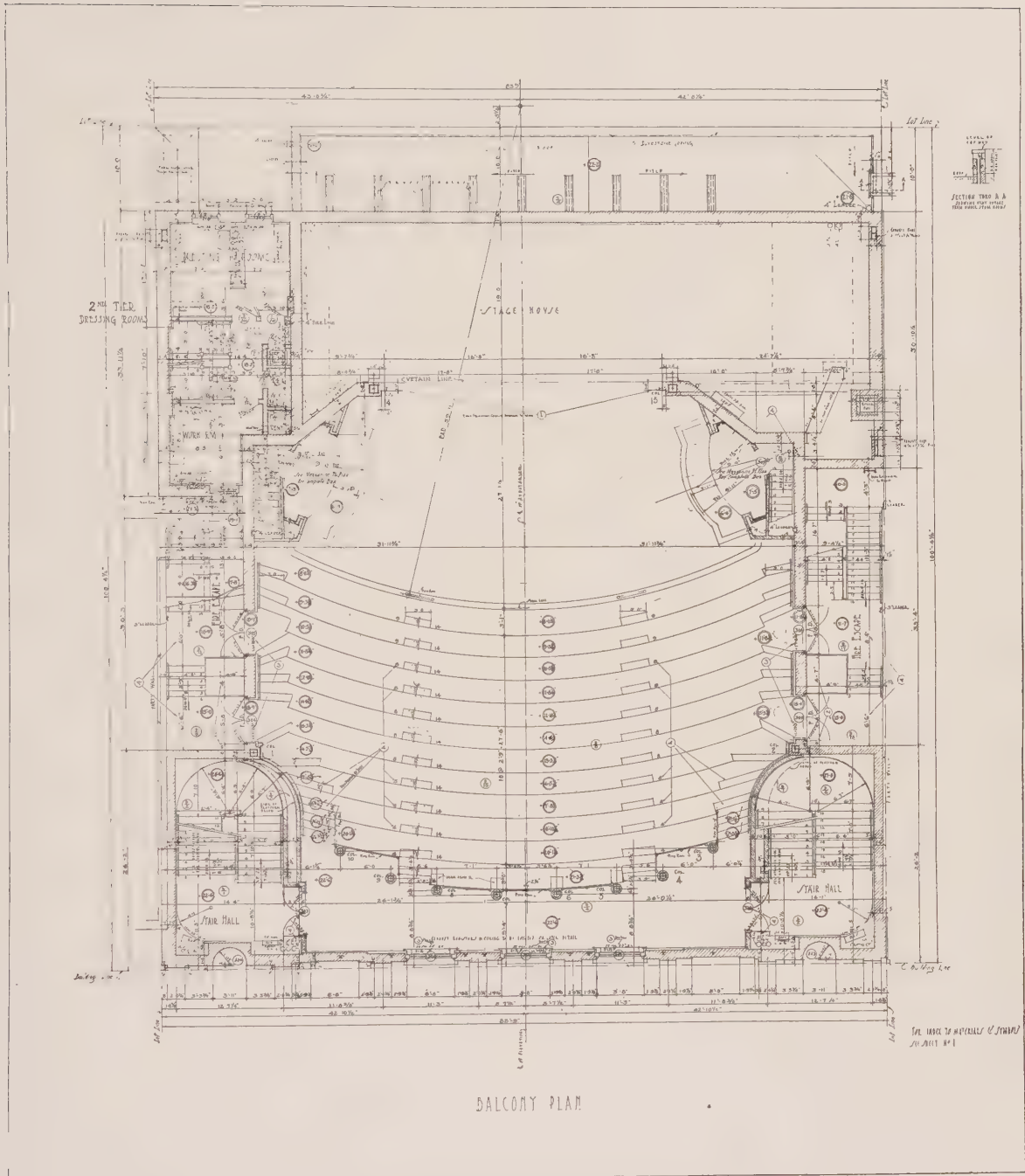
• CELLAR PLAN •

Cellar Plan, Henry Miller's Theatre, New York City
 Paul R. Allen, Architect, Harry Creighton Ingalls, Associate

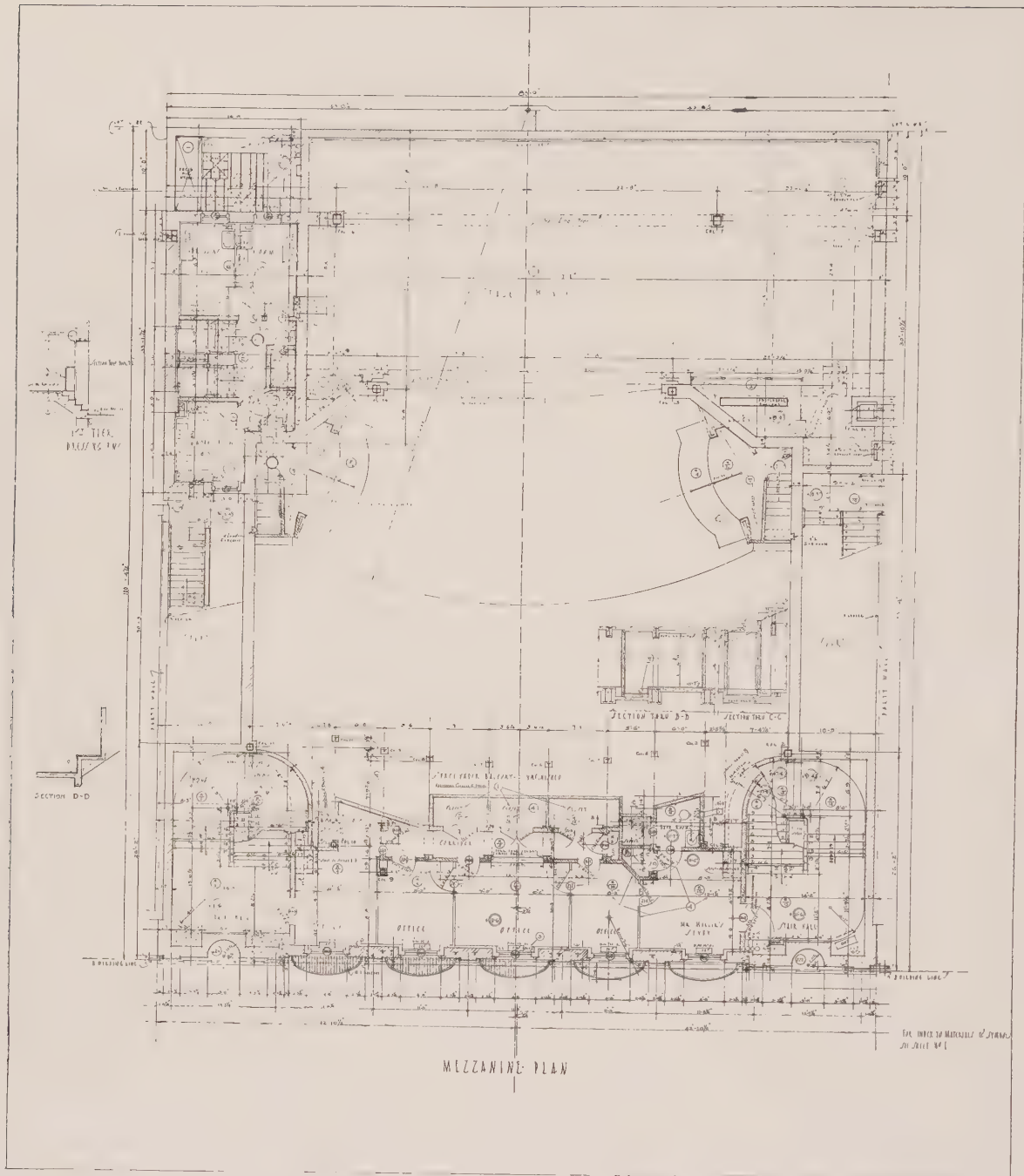
THE PRACTICAL REQUIREMENTS



First Floor Plan, Henry Miller's Theatre, New York City
 Paul R. Allen, Architect, Harry Creighton Ingalls, Associate

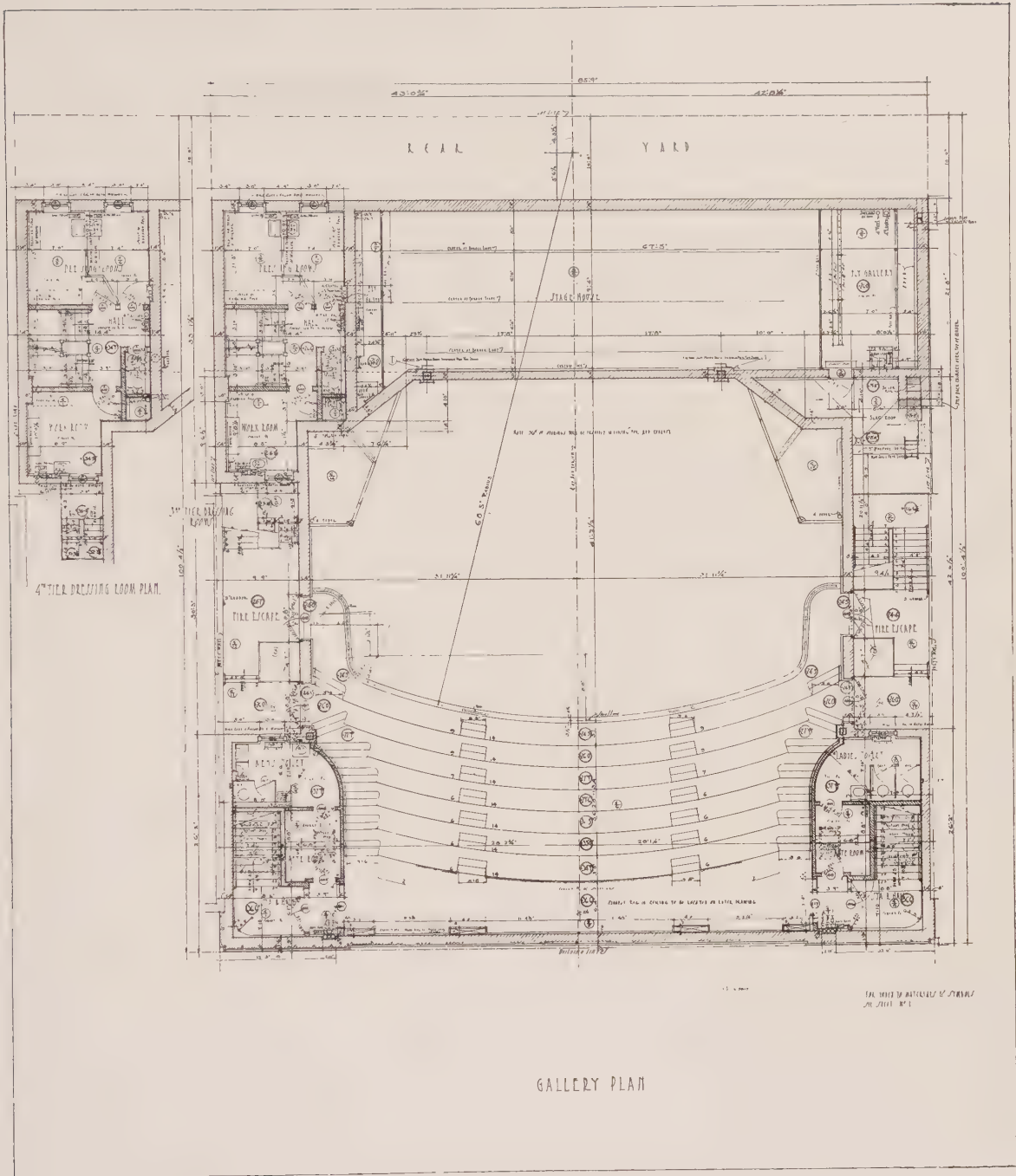


Balcony Plan, Henry Miller's Theatre, New York City
 Paul R. Allen, Architect, Harry Creighton Ingalls, Associate



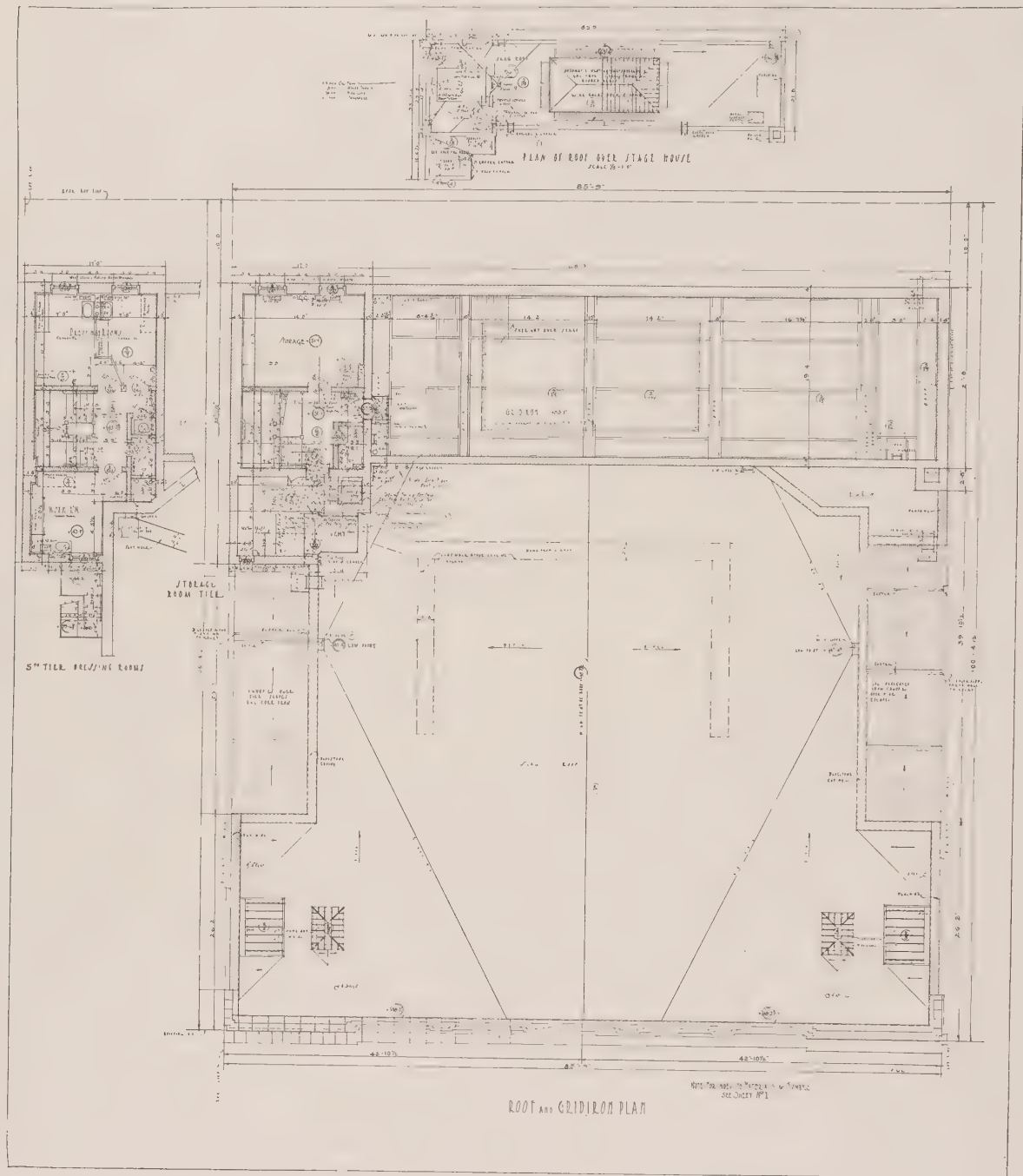
Mezzanine Plan, Henry Miller's Theatre, New York City
 Paul R. Allen, Architect, Harry Creighton Ingalls, Associate

OF MODERN BUILDINGS

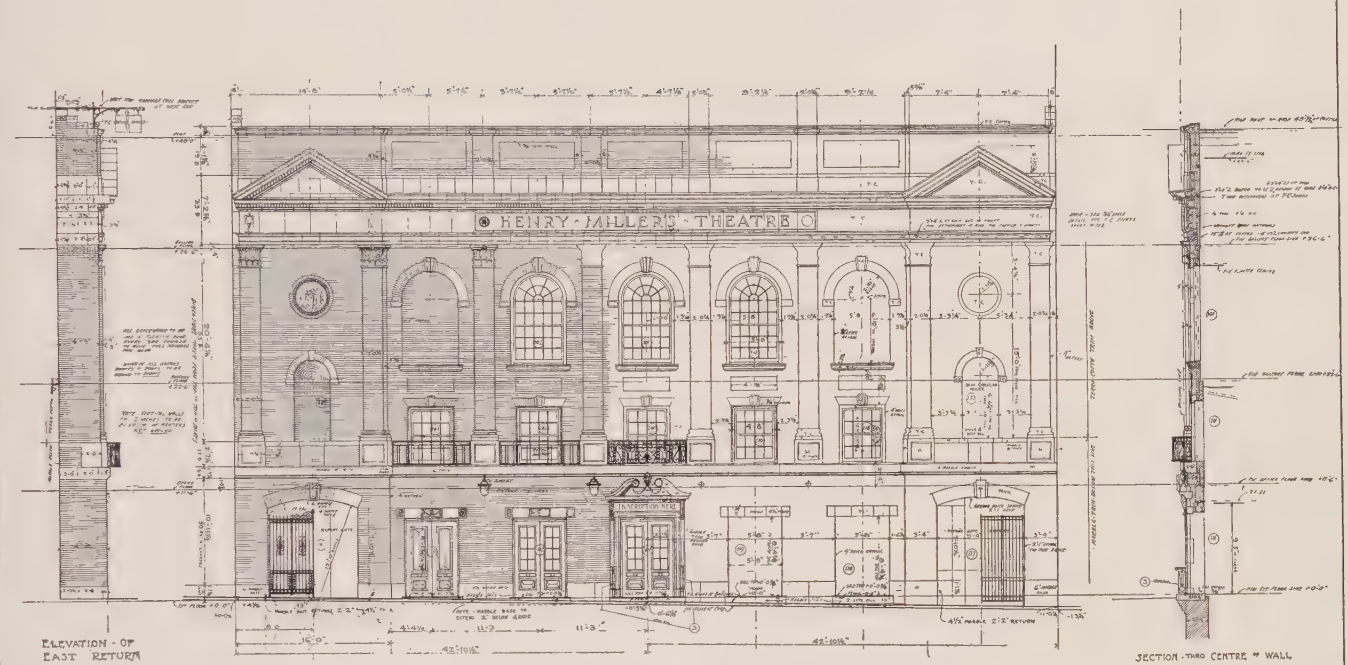


GALLERY PLAN, Henry Miller's Theatre, New York City
 Paul R. Allen, Architect, Harry Creighton Ingalls, Associate

THE PRACTICAL REQUIREMENTS



Roof and Gridiron Plan, Henry Miller's Theatre, New York City
Paul R. Allen, Architect, Harry Creighton Ingalls, Associate

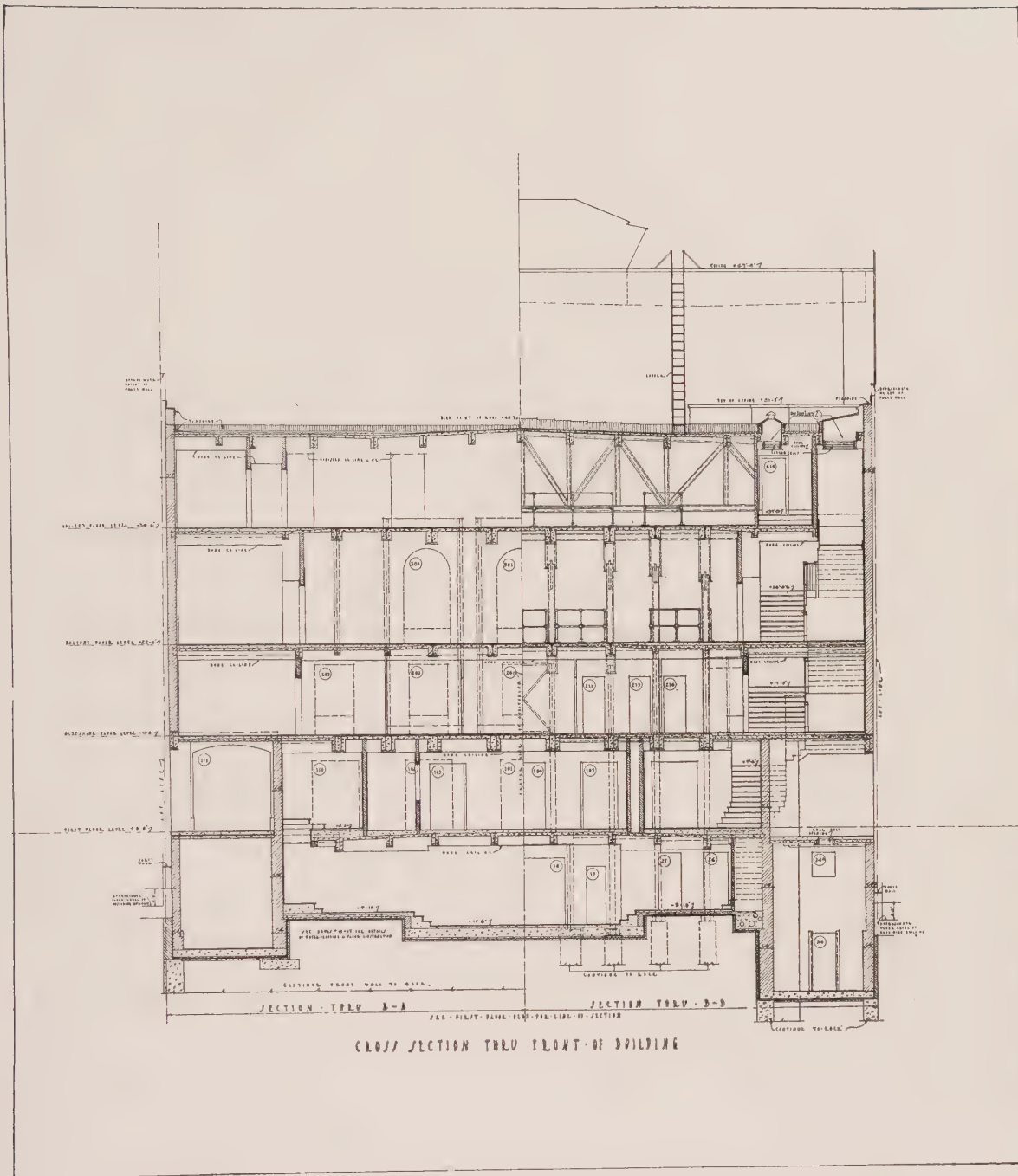


REVISED - FRONT - ELEVATION -

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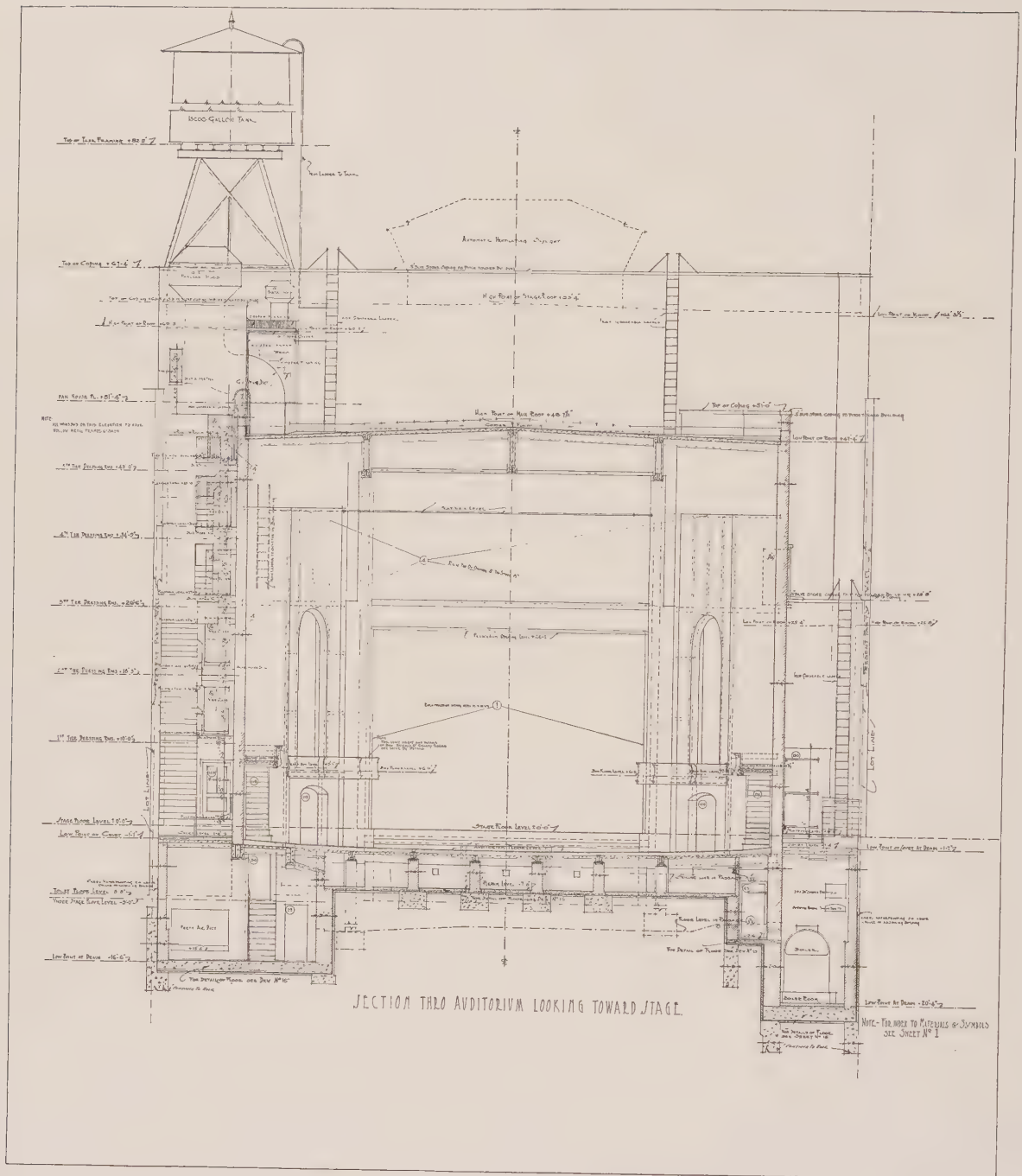
Front Elevation, Henry Miller's Theatre, New York City
Paul R. Allen, Architect, Harry Creighton Ingalls, Associate

Rear Elevation, Henry Miller's Theatre, New York City
Paul R. Allen, Architect, Harry Creighton Ingalls, Associate

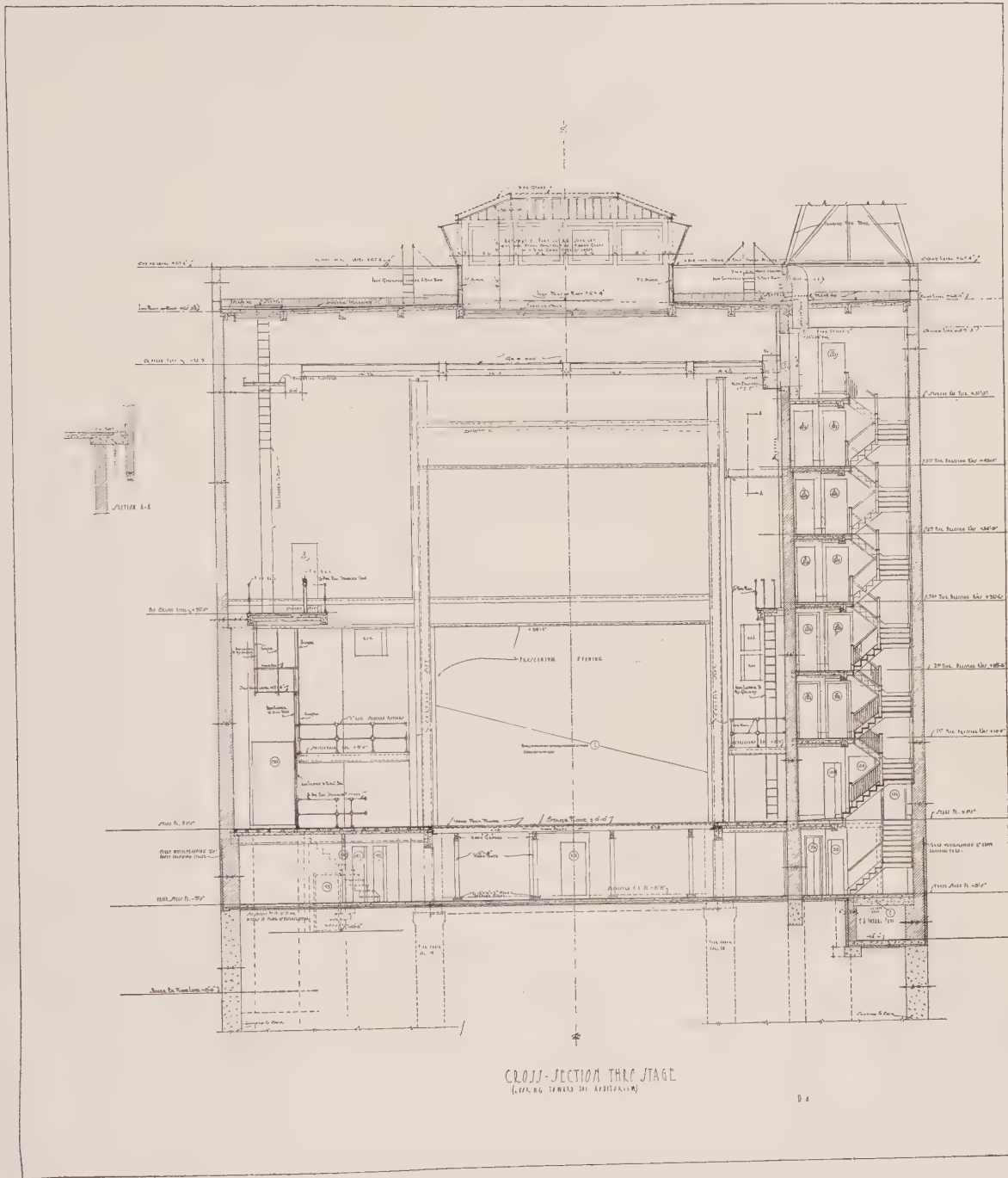


Cross Section Through Front of Building, Henry Miller's Theatre, New York City
Paul R. Allen, Architect, Harry Creighton Ingalls, Associate

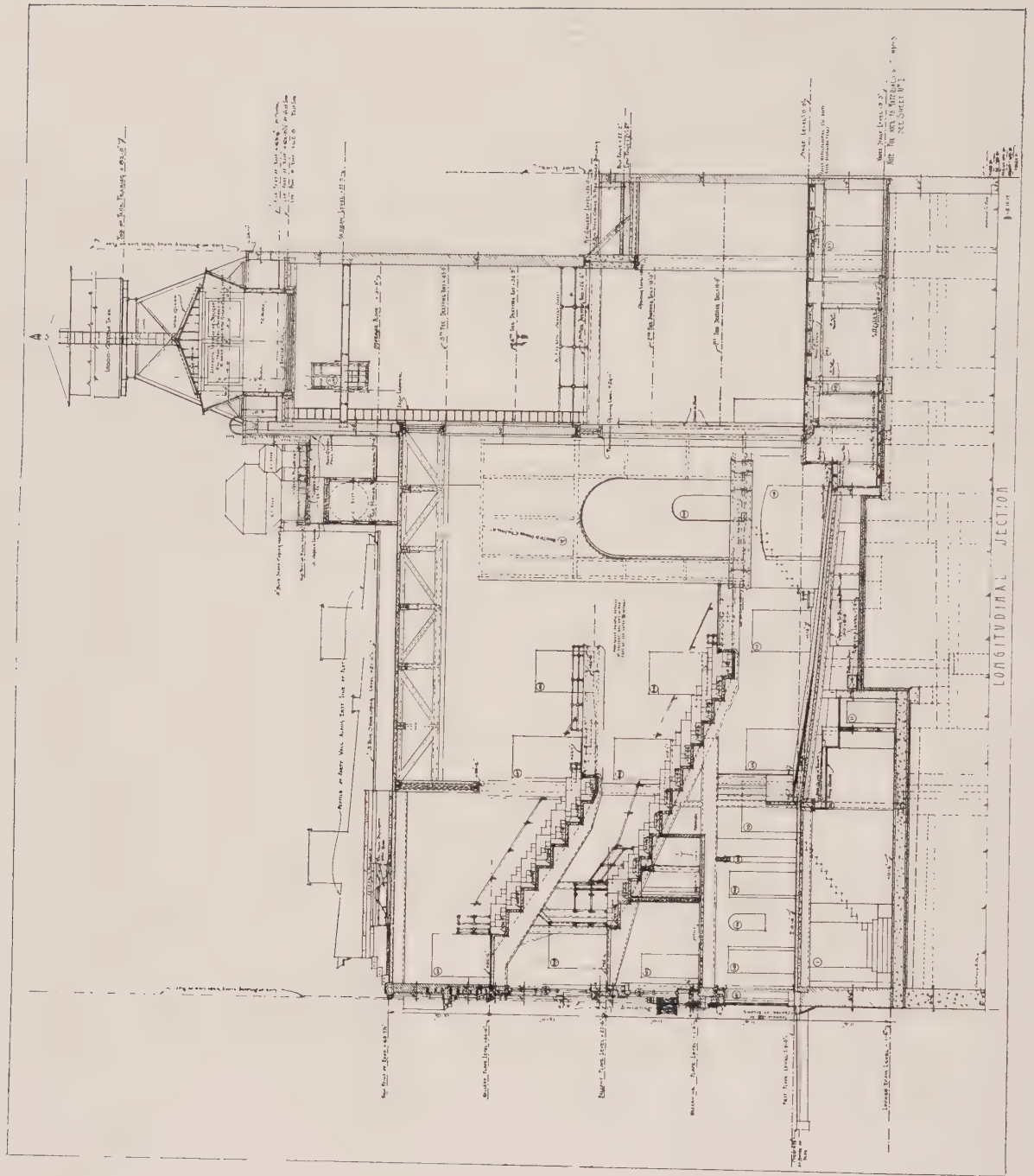
THE PRACTICAL REQUIREMENTS



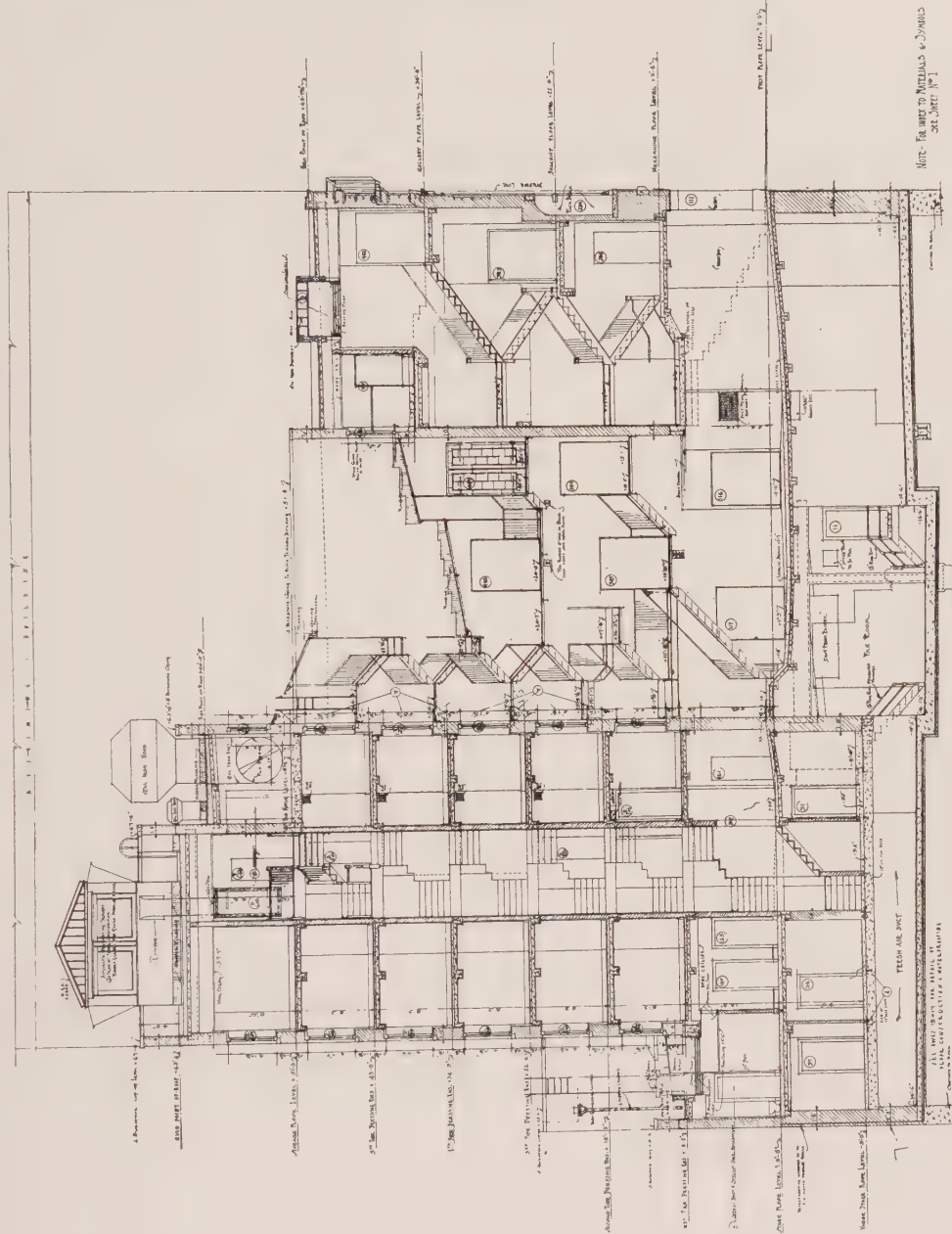
Section Through Auditorium Looking Towards Stage, Henry Miller's Theatre, New York City
Henry R. Allen, Architect, Harry Creighton Ingalls, Associate



Cross Section Through Stage, Henry Miller's Theatre, New York City
Paul R. Allen, Architect, Harry Creighton Ingalls, Associate



Longitudinal Section, Henry Miller's Theatre, New York City
Paul R. Allen, Architect, Harry Creighton Ingalls, Associate



EAST COURT SECTION

East Court Section, Henry Miller's Theatre, New York City
 Paul R. Allen, Architect, Harry Creighton Ingalls, Associate

CHAPTER X

COMMERCIAL AND INDUSTRIAL BUILDINGS

BUSINESS buildings present widely varied requirements according to the nature of the business they are intended to house and they naturally fall into the following groups: stores, offices, banks, lofts and factories.

Stores may, for convenience, be divided into department stores and other stores, for a department store is a highly developed and complex organism that needs to be considered separately and in some detail.

Among stores other than department stores, we may class not only the business places usually known as stores, but also beauty parlors, many restaurants, galleries for the sale of paintings, and innumerable other places of business—in fact a range that includes everything from groceries to works of art, each business with different requirements. But all of these business places have in common the need to impress and attract customers by their exterior appearance. Now, there are two directly opposite ways of impressing and attracting passers-by. On the one hand some storekeepers use show windows that are as large as possible for the display of their goods; these are in the majority. Others take the opposite method of showing little if anything in their windows. Tiffany's windows contain no jewelry, they admit light to the store and they are ornamented by a bronze statue or two, hardly enough to relieve them of bareness. Ovington's depends upon the striking effect of very small windows framed in

ornamental bronze and set in plain walls. The few art objects exposed in these windows have their value enhanced by this method of display, which gives a sense of preciousness. Delman's employs the same method for the display of shoes in small windows on the ground floor and presents a distinctly novel display in a second-story window. This window is elliptical, and is edged with ornamental bronze that gives the impression of a picture frame. Within this frame is an animated picture, for every day shoemakers may be seen at work there, busily making shoes by hand in the old-time way. The whole thing is decoratively treated and highly effective. The picture of Delman's on page 168 shows this method of display. The Childs' restaurants that occupy the ground floor of the building shown on this page and one of those on page 168 make uses of the idea of a handsome frame about a scene of activity. There are almost always people standing in front of the curved glass window at the corner of the building on this page, watching the making of griddle cakes in the fashionable shopping section of Fifth Avenue. Over on Broadway in the Forties is the Lucky Strike display, a corner store occupied by machines turning out cigarettes. The interior is seen through unusual elliptical windows. William Van Alen, who was the architect of Delman's and of the Childs' restaurants mentioned, also designed the store front



Building at 604 Fifth Avenue, New York City
William Van Alen, Architect

for this highly effective cigarette display.

In the stores that occupy the upper floors of the building shown on page 167 the aim has been to secure as much daylight as possible and to attract attention by a big expanse of glass. Stores above the street level need to make their windows count at a distance, across the street, and the big glass goes a long way towards accomplishing this purpose. For one thing, the large uninterrupted surface of glass affords an opportunity to display the name of the firm in large gilt letters, and this is highly valued by most business men whose shops are above the street level.

In the case of this building full advantage has been taken of the fact that the adjoining church stands clear and somewhat back and makes this practically a corner building. Bent glass has been carried right around the corner, something made possible by steel frame construction, the columns being set back from the corner and the corner of each floor being carried on steel cantilevers.

Another notable feature of this building is that the glass is set practically flush with

square foot is very valuable.

The thing that is notable about the building shown in the upper part of this page is its simple, pleasing expression of steel frame construction and the en-



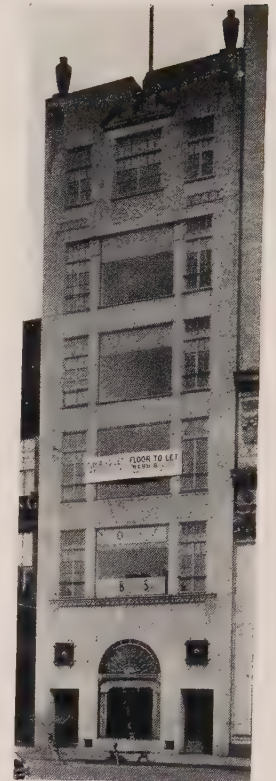
Business Buildings of Different Types
William Van Alen, Architect



the surface of the wall. This is a frank expression of modern construction, with no attempt to retain the deep reveals that are characteristic of masonry. Setting the window glass out as far as it will go makes more floor space inside, and in a location such as this every

plenty of daylight has been met and the fenestration has been handled in such a way that it gives the building a good appearance without the aid of architectural features applied for effect.

An outstanding example of modern designing based on the simple, direct expression of the practical requirements of a present-day business building of steel clothed with brick is the One Park Avenue Building, Buchman & Kahn, architects, which is shown on page 170 and following pages. This is a building for the better class of business and it has been given suitable dignity in its design. The materials of the surface, brick and



richment of the window in the ground floor front with well designed bronze work.

The upper stories of the building in the center of this page are made unusually light by the massing together of windows with only narrow piers between the groups. This is expressive of the present-day demand for all the daylight that can be had in many business offices and lofts. The lower stories, too, are largely glass enclosed.

The building shown on page 169, Crow, Lewis & Wick, architects, was designed with the requirements of the printing trades in mind. The need for

terra cotta almost entirely, have been used in simple forms well studied and color has been used on the higher parts where ornament would not be so easily seen from the street.

The bigness of the scale of the building shown at the top of page 174, its simplicity and the way in which the convergence of its sides has been prevented from causing the sense of narrowness common in such cases are especially interesting features. William Van Alen was the architect.

A department store is almost as much a machine as it is a building. As an especially good example of successful designing to meet the requirements peculiar to the department store several drawings are shown here of the addition to the store of R. H. Macy & Co., Inc., Robert D. Kohn and Associates, architects.

The plan on page 174 shows both the older portion of the building and the addition, the latter being at the left of the transverse wall. On page 176 is a poché plan of the first floor of the addition. The building extends through the block, from Thirty-fourth Street to Thirty-fifth Street at the north. At the right is seen the connection with the older building.

Goods are received on the north side and taken to the floors given over to reserve stock, in the upper part of the building. From here they are sent down to the various departments to replenish the supply of merchandise on the sales floors, which is being constantly depleted by the purchases of customers. The goods come down from the reserve stock by means of elevators and chutes.

When goods are sold they are taken to one of the stations that are conveniently located and sent down to the delivery department, where the parcels are sorted and put into the delivery wagons. The basement plan, page 175, shows how this part of the work is taken care of.

Throughout the modern department store, goods and people are in rapid circulation during the business day. It can be seen readily enough



Building for the Printing Trades, New York City
Crow, Lewis & Wick, Architects

that the advice of a man who has specialized on the subject of conveyor systems for such stores is needed in laying out the equipment for circulating merchandise. So far as the circulation of people is concerned, it has been found that where a very large number must be handled expeditiously, escalators should be installed as well as elevators, for an escalator can take care of a steady stream of people. In the stores that, though large, do not handle large crowds escalators are not used generally, elevators only being used.

The way in which the newer department store buildings differ most strikingly from the older type is in the absence of the central light well that used to be a characteristic fea-

ture of the department store. This light well or interior light court, with gallery-like floors all around it, took space that is better used for the display and sale of goods, furthermore it increased the danger of a serious fire very greatly, since it tended to act as a great chimney flue in case of fire, a very dangerous feature.

The elimination of the light court from the department store plan has been brought about by the great improvement that has taken place during the last few years in artificial lighting. Goods can be shown satisfactorily under electric light now and the few departments in which it is desirable to be able to examine goods by daylight can be placed along the outside of the building. Some department store men prefer electric light to daylight, on the ground that the artificial light shows the goods in general to better advantage than daylight.

About one-half of the total floor area of a department store is used for the sale of goods, the rest is occupied by reserve stock, by clerical and administrative offices, and by facilities for caring for the needs of the employees, through a lunch room, toilet rooms, locker rooms, and perhaps a dental clinic, etc. Each department store has its own special requirements. Its class of trade, the

personal opinions of the men in authority, and its traditions largely determine these requirements. With expert advice upon such matters as the conveyor system, and the fixtures and other equipment the architect needs to study the operation and character of the business of the particular store for which he is designing a building and make a scheme that will fit the case.

Though manufacturing plants differ widely in their requirements, according to the nature of the product and of the operations to be performed, they have in common the need for means of receiving the raw materials, and circulating them through the plant, while they are being submitted to the various processes that convert them into the finished product, then packing and shipping the goods out of the plant. There should be a steady onward line of travel of the materials through the plant. Then, too, there are the needs of the employees to provide for. Perhaps the provision for them may be so simple as toilet rooms or so extensive as to come under the heading of welfare work, including a cafeteria, dental clinic, gymnasium or any number of the features now included under that heading. The care for the welfare of the employees may even extend so far as housing, which is, of course, in a different architectural sphere from the designing of the buildings of manufacturing plants.

The general requirements of a manufacturing plant are well met by a factory group designed by Buchman & Kahn described below. The site is one well adapted to the purpose, for besides the driveways on the level of the first floor serving each building, concrete bridges over these driveways give access to a secondary roadway on the level of the second floor, circling the plant. It is thus possible to bring trucks with heavy material to any particular point and save hauling through the buildings. The group lies within a "V" of railroad tracks that permits handling goods directly to and from the cars at two sides of the plant.

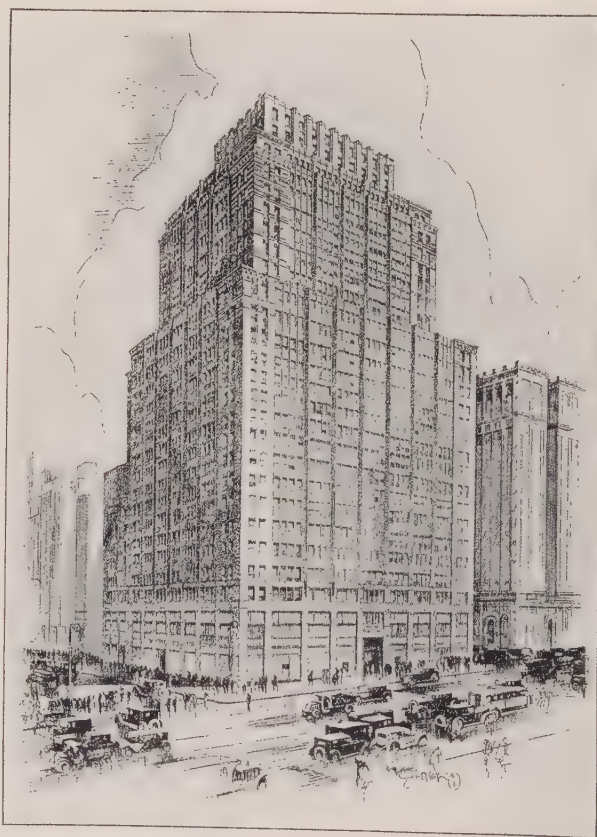
In the Kahn & Feldman plant, illustrated on page 177, the stairs,

elevators and toilet rooms are placed outside of the main shell of the buildings. The design character is derived entirely from the use of structural elements and without recourse to any unnecessary, quasi-decorative features.

The essential parts of a bank are shown on page 179 in the plan of the Bank of Niagara, Niagara Falls, N. Y., Carrere & Hastings, architects, Shreve, Lamb & Blake, associates. The public space, the bookkeepers' working space, the board room, the vault, and the space for the officers, near the door where it is separated from the public by only a railing, are all here. The sizes of these various spaces indicated are good working sizes. The arrangement of these parts differs, in different banks in order that the plan many conform to the shape and size of the plot or to individual ideas of convenience or good appearance.

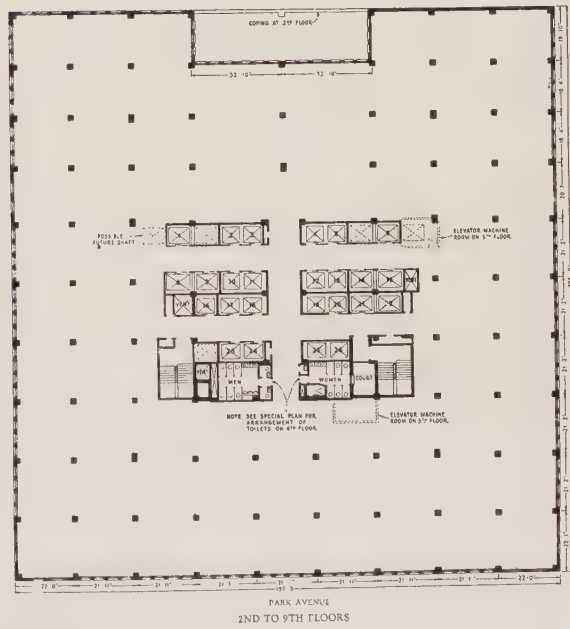
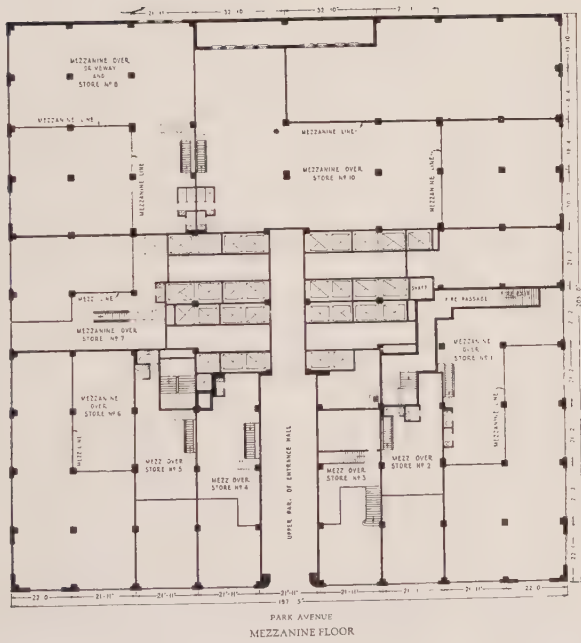
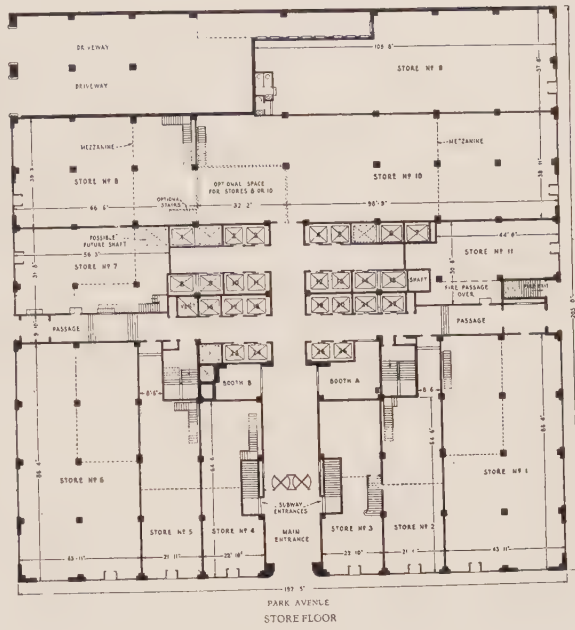
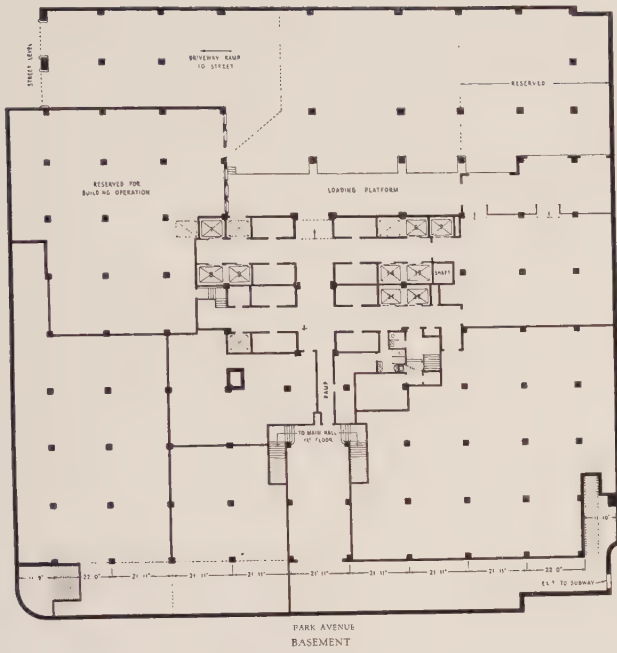
It is to be noted that the space for officers should be at the front. The officers must be accessible to people having business to transact with them and they need good light on their desks. This calls for a window of good size in the façade at this point. This window, and often a balancing window in the board room if they are made features of the design, as in the Bank of Niagara, contribute to the design. If an attempt is made to suppress them, as is sometimes the case, the result is often very unfortunate.

One of the requirements of a bank is that it make a favorable impression upon the public. In recent years there has been a marked change in the opinions of many as to what a bank should look like. Years ago it was generally thought that a bank should look impregnable, that its walls should seem massive and that its windows should be guarded by heavy bars of iron. Presumably the thought was to impress people with the idea that it was a safe depository for money. But people in general know nowadays that the steel vault, not the building, protects the funds of a bank and while a modicum of apparent strength is a desirable quality, usually, in a bank building, this effect is easily over-



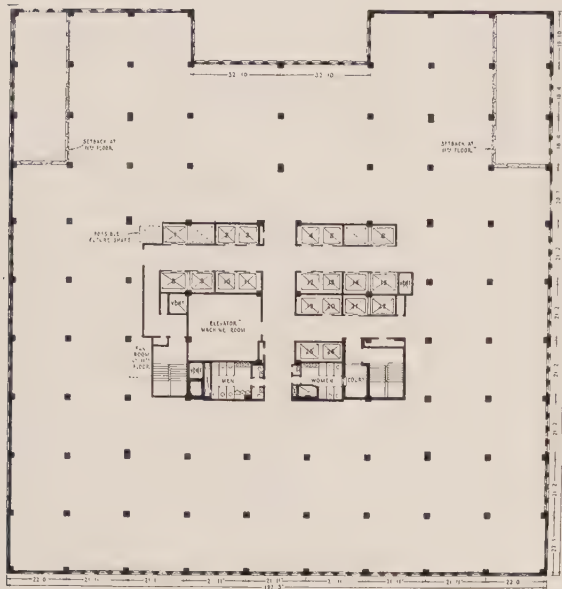
The Park Avenue Building, New York City
Buchman & Kahn, Architects

OF MODERN BUILDINGS

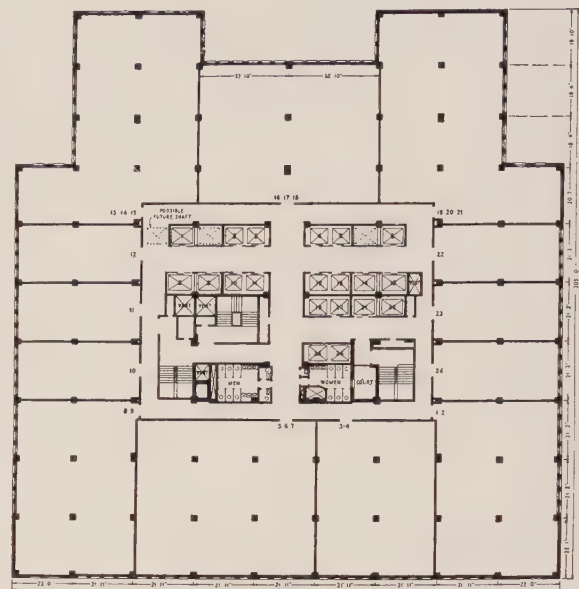


The Park Avenue Building, New York City
Buchman & Kahn, Architects

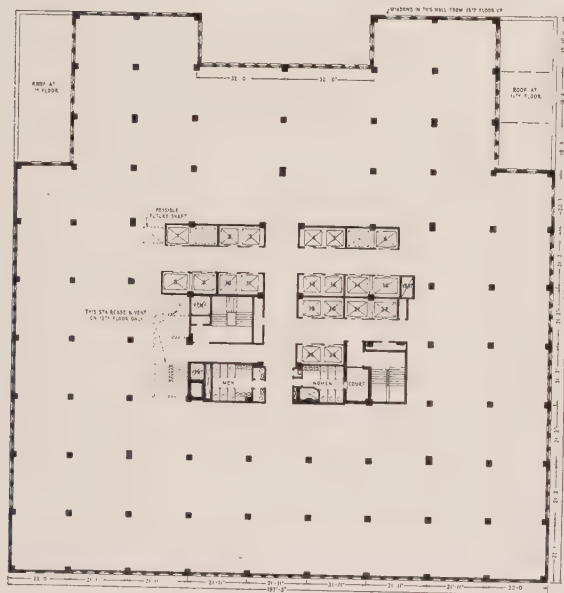
THE PRACTICAL REQUIREMENTS



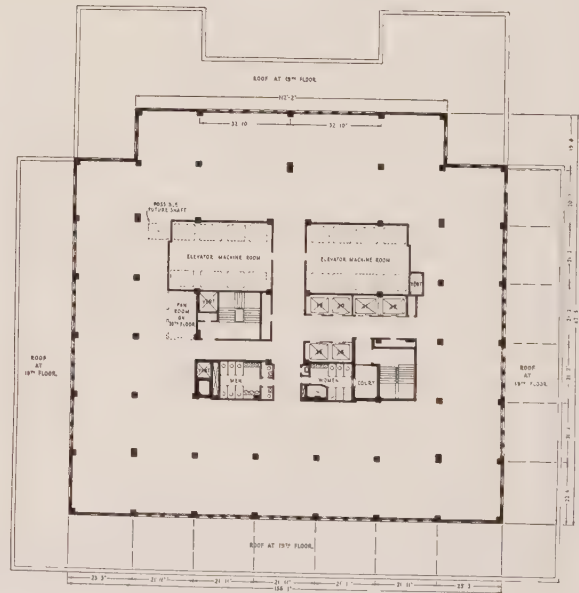
PARK AVENUE
10TH & 11TH FLOORS



PARK AVENUE
12TH FLOOR
WITH POSSIBLE SUB-DIVISIONS



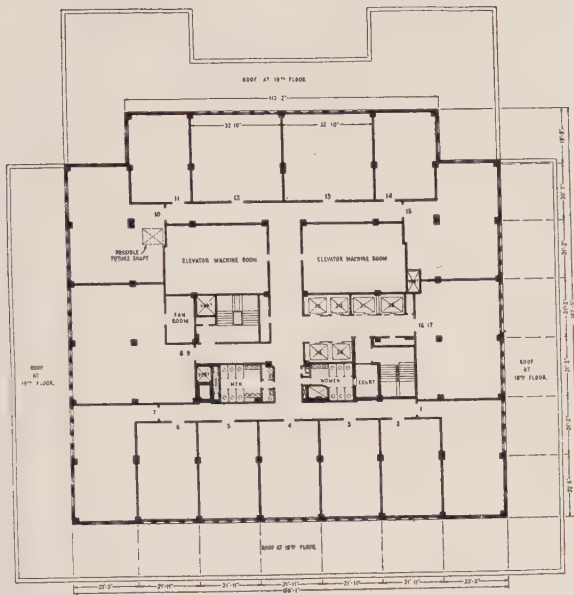
PARK AVENUE
12TH & 14TH TO 18TH FLOORS



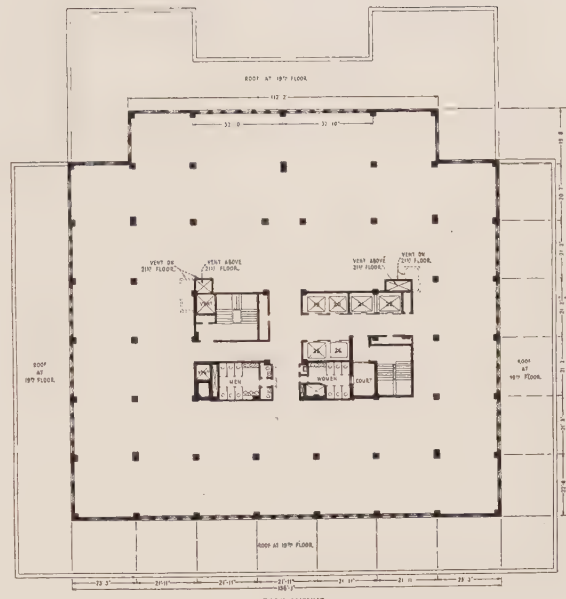
PARK AVENUE
19TH & 20TH FLOORS

The Park Avenue Building, New York City
Buchman & Kahn, Architects

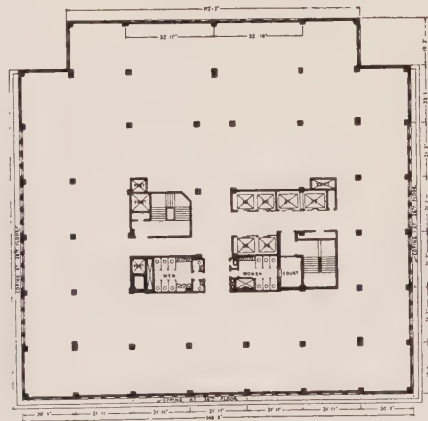
OF MODERN BUILDINGS



PARK AVENUE
20TH FLOOR
WITH POSSIBLE SUBDIVISIONS



PARK AVENUE
21ST TO 24TH FLOORS



PARK AVENUE
26TH FLOOR

The Park Avenue Building, New York City
Buchman & Kahn, Architects

done. The tendency is distinctly away from the forbidding ponderousness of former years, though one sometimes sees a case of reversion.

One thing that probably has had much to do with the drift away from the monumental in bank design is the establishment of branches of big banking organizations in the various sections of the city, for the convenience of the business men and residents. These branch banks have quite commonly been installed on the ground floor of buildings the upper floors of which are occupied by offices; they are simply stores, so far as exterior architecture is concerned. So, this practical requirement of appearance—practical since it has its definite relation to the success of the bank—is a variable one. Dignity is essential always and it is often lost in an attempt to secure it in the design of a small bank by adopting a manner that, though impressive in a building of large scale, verges upon the ludicrous when photographed down to the size of a neighborhood bank in an outlying section of the city or of a bank in a small town. The type of design that seems to be most frequently misapplied in this way is that which is marked by a very tall, wide central window, lighting the banking space, flanked by pylons or heavy columns. When this kind of façade is reduced greatly it looks lamentably like a toy. These matters of design have a definite



Childs Restaurant, 600 North Capitol St.,
Washington, D. C.

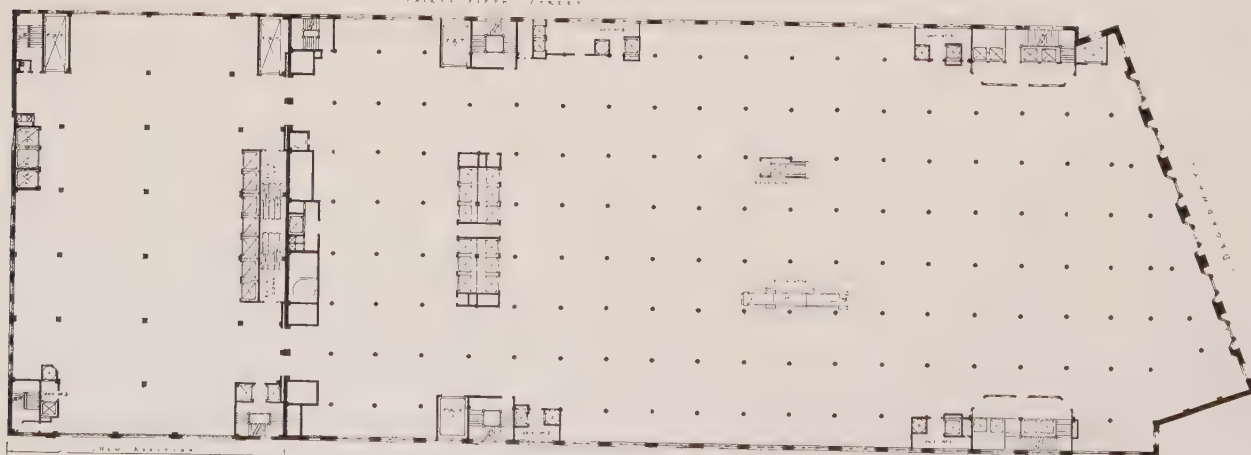
William Van Alen, Architect

relation to the practical requirements which makes comment here in order. The problem is to study the practical requirements of the bank with a suitable exterior treatment in mind. In the case of most banks this means an exterior that will harmonize with the stores and office buildings which surround a bank on a business street or with the stores and apartment houses that surround a bank in a residential neighborhood. In the case of some banks it is desirable to adopt a style of

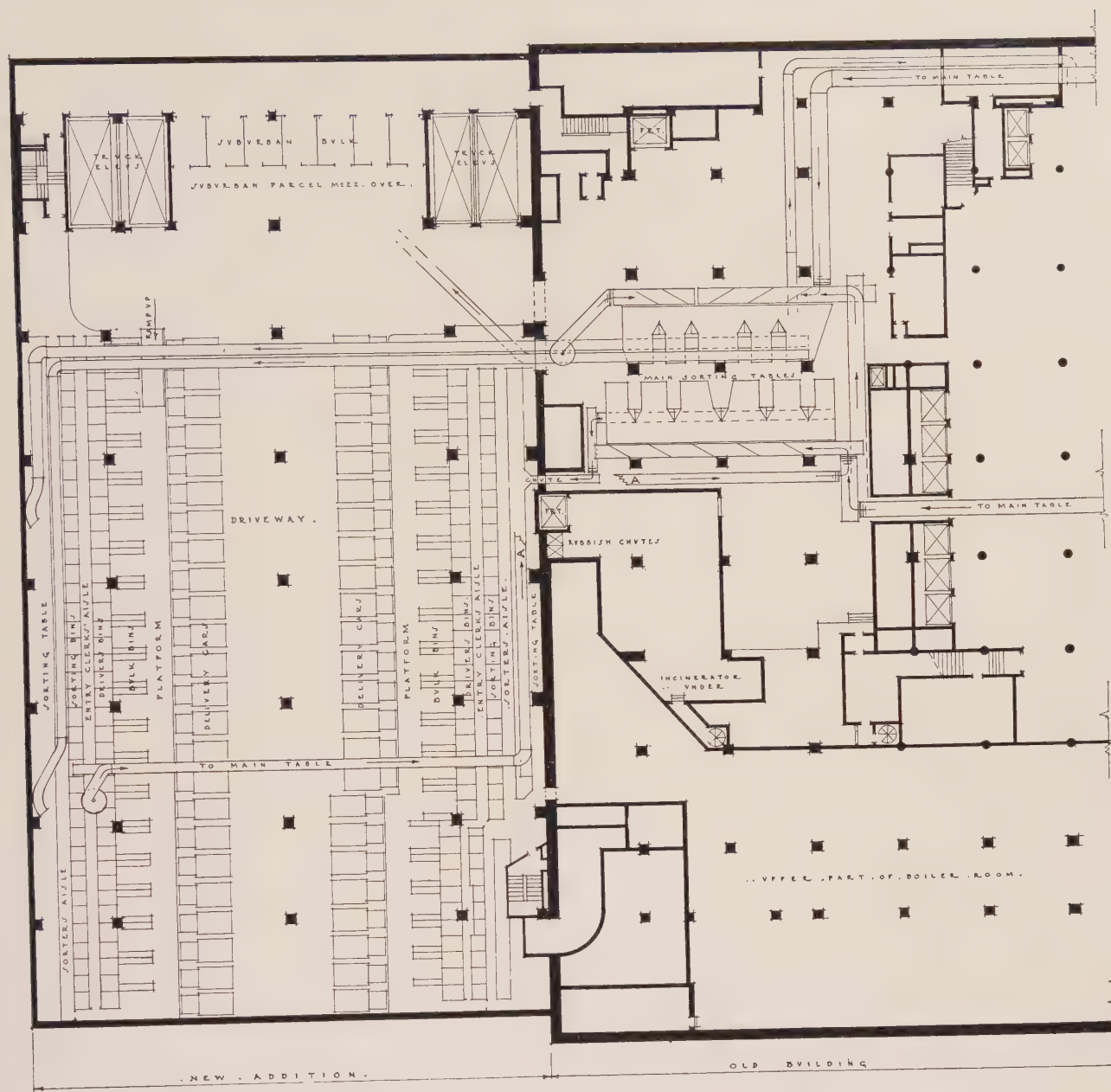
treatment that has much of the character of the distinctly domestic architecture of the surrounding homes.

What has been said above in regard to the exterior treatment of bank buildings applies to other business buildings, though bank buildings are the worst offenders in this matter of incongruity, probably because they are often more pretentious than other business buildings. But stores and office buildings should also be in character with the neighborhood in which they are built. A department store that harmonizes with the surrounding apartment houses and hotel buildings or with the office buildings is much better in appearance than one that looks like a part of a larger city or of a different section of the city transplanted bodily to strange surroundings.

Among the practical requirements of business buildings is the requirement of low maintenance



Typical Sales Floor Plan, Addition to Department Store for R. H. Macy & Co., Inc., New York City
Robert D. Kohn and Associates, Architects

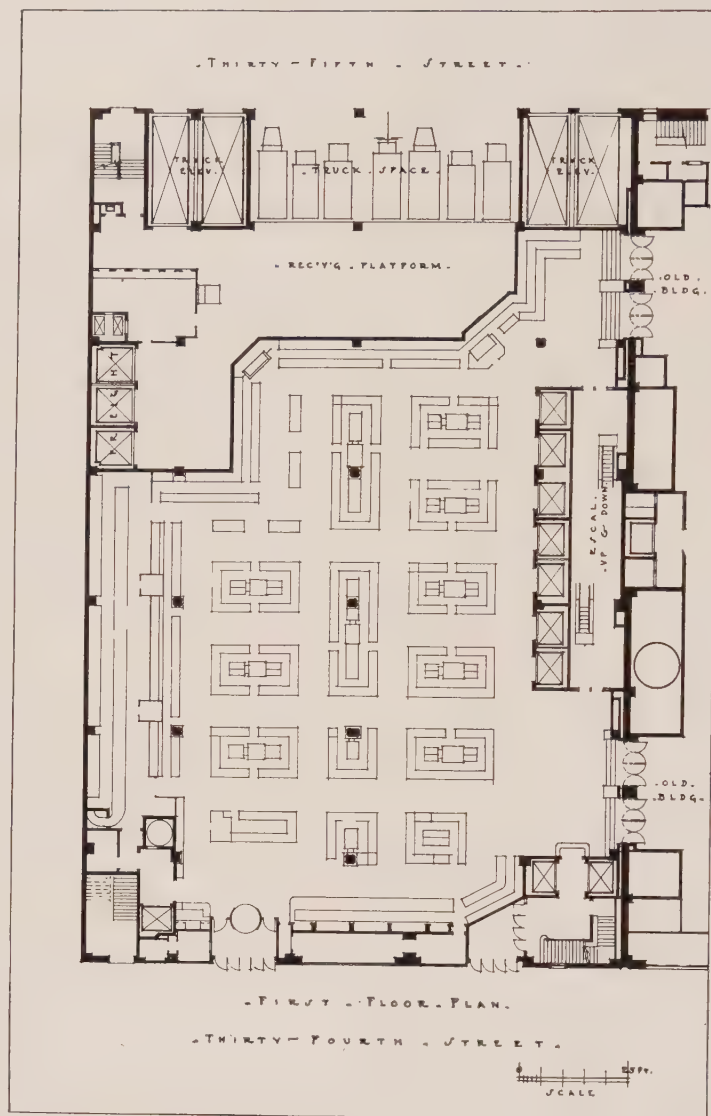


Basement Plan Showing Delivery System, Addition to Department Store of R. H. Macy & Co., Inc., New York City

and operating costs. Building managers are now going into such matters as the cost of polishing the brass work, and of scrubbing the floors of the lobbies and public passages of buildings as well as the cost of keeping the exterior looking new and fresh. This requirement needs to be taken into account in the selection of materials and finishes, both for the exterior and the interior, for the hardware and fittings as well as the facing material of the structure.

The practical requirements have moulded and revolutionized the architecture of our business buildings. The greatest change, of course, is that made by the introduction of the set-back stories dictated by the practical requirement for light in the lower part of our business buildings in the sections where tall buildings are the rule. The requirement for light in business buildings has also very largely done away with the old-time deep reveals and the rows of columns between windows because these traditional features cut down the light received by the interior. Since modern steel frame construction has given us the means of building with only comparatively slender piers between wide areas of glass, we are able to meet this requirement for the maximum amount of daylight. Little has been done until quite recently to make the translation of these practical requirements into modern construction a really effective manner of design. Only lately, after many years of clinging to the use of masonry architecture in clothing a steel frame building, have we begun to grasp the possibilities of this combination of practical requirements and modern construction.

Many of our business buildings are impressive



First Floor Plan, Addition to Department Store of
R. H. Macy & Co., Inc., New York City
Robert D. Kohn and Associates, Architects

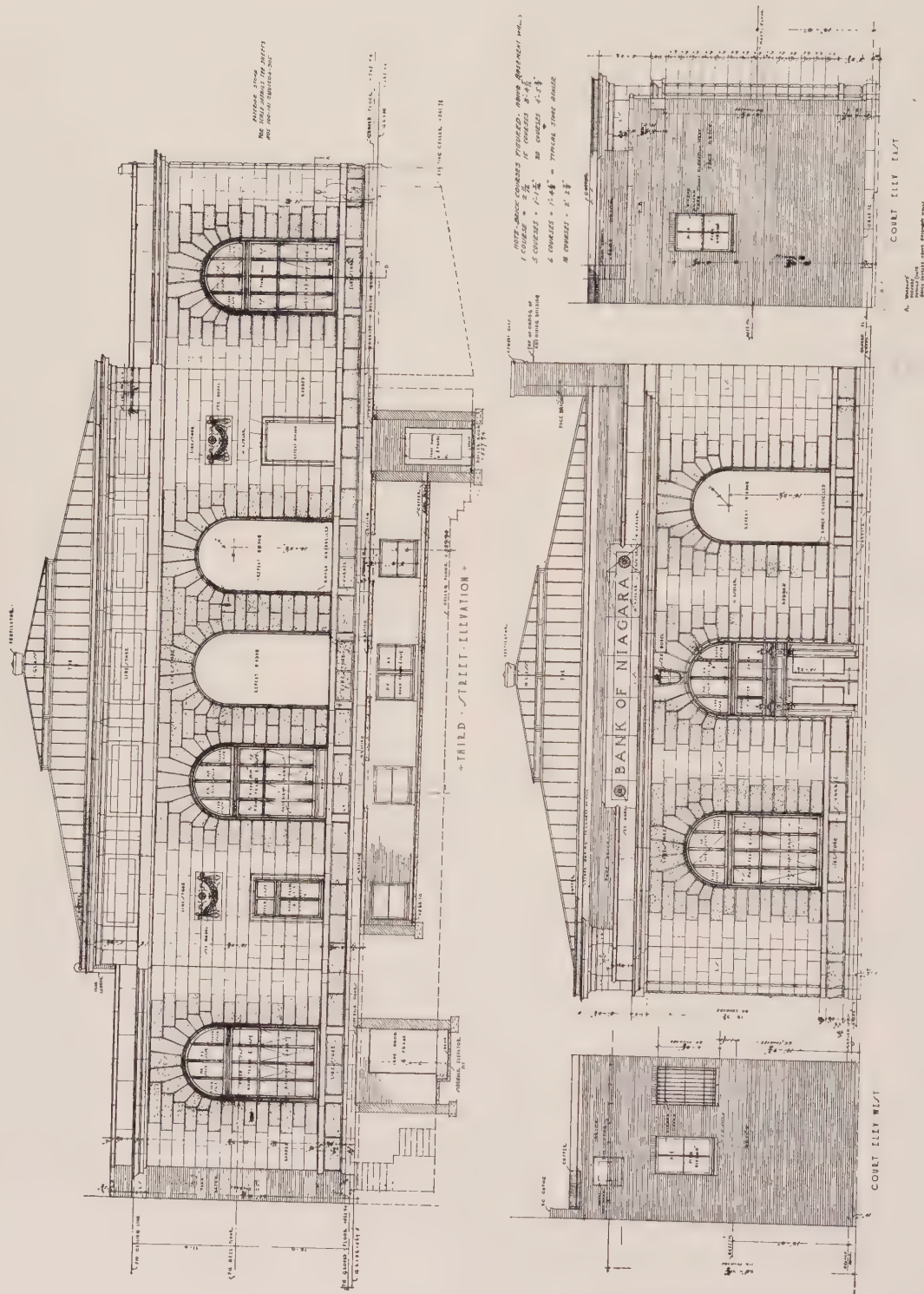
when the floors appear plane above plane with only relatively slender steel uprights between, then when the enclosing shell is applied they so often become dull and uninteresting, like cardboard boxes pierced at regular intervals with rectangular holes. The sense of the planes of the floors, which could so easily be retained, is lost.

There have been isolated examples, for instance the industrial building by Buchman & Kahn which is illustrated on page 177. Though built some years ago, it is a frank and perfectly logical expression of the practical requirements and of the construction, handled in such a way that a pleasing appearance results. To go further back, there was Louis Sullivan's work and the pioneer work done by Frank Lloyd Wright more

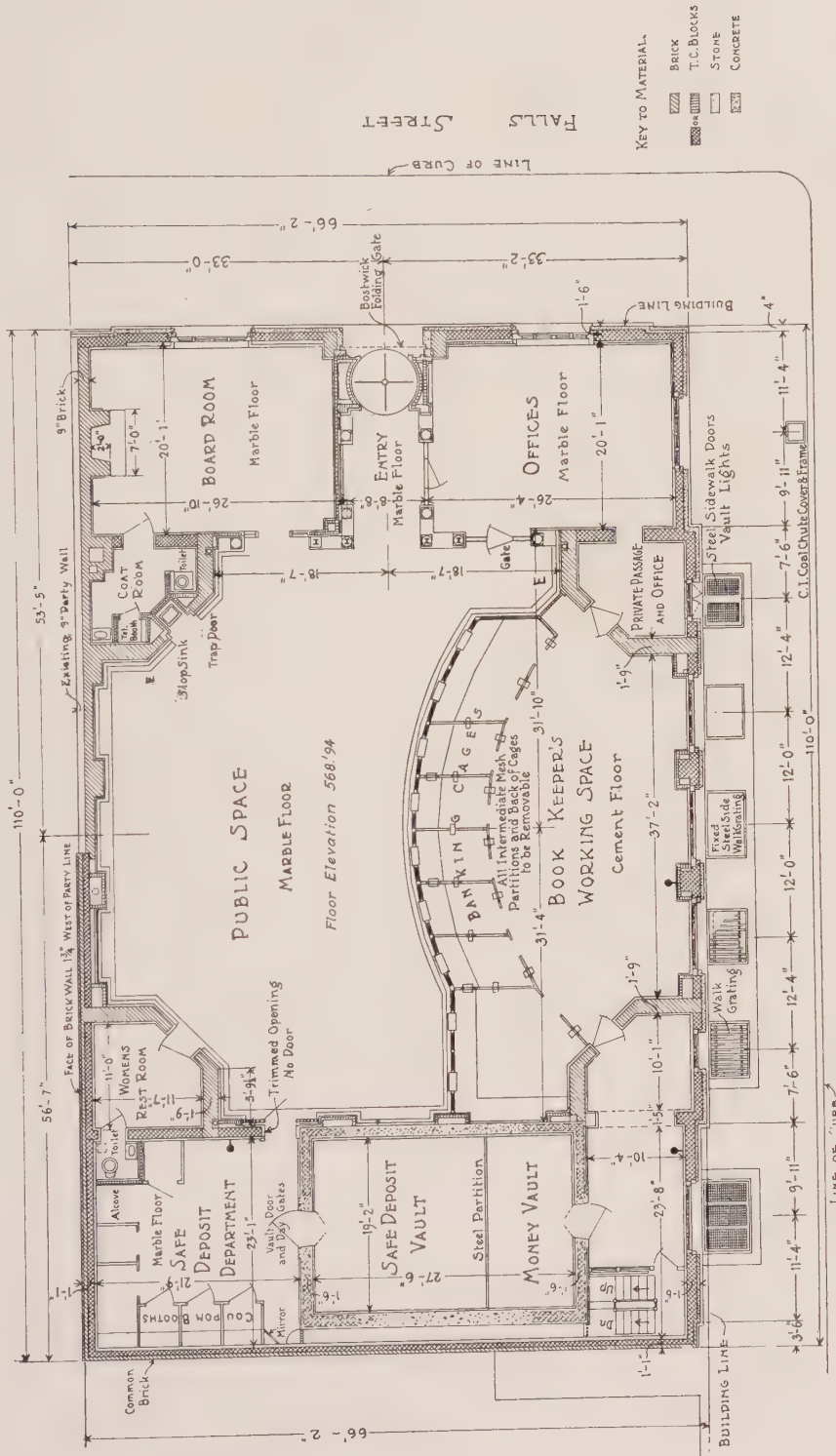
than a quarter of a century ago. The time was not ripe for those things then, so it seems, but the most direct expression of the requirements and the construction is welcomed and appreciated today. Many of the attempts made in this direction only a few years ago showed an almost complete lack of appreciation of the opportunities for making a factory building interesting and pleasing to the eye through the proper proportioning and arrangement of its necessary parts. Often, in an attempt to relieve these buildings of the ugliness of ill considered composition, an encrustation of "architecture" was applied to the tops of the chimneys and to other favored spots. A system of construction completely at variance with all of the old architectural forms was emerging with shreds and tatters of the old architecture clinging in places to its ugly newness. Today we know much better how to express the construction.



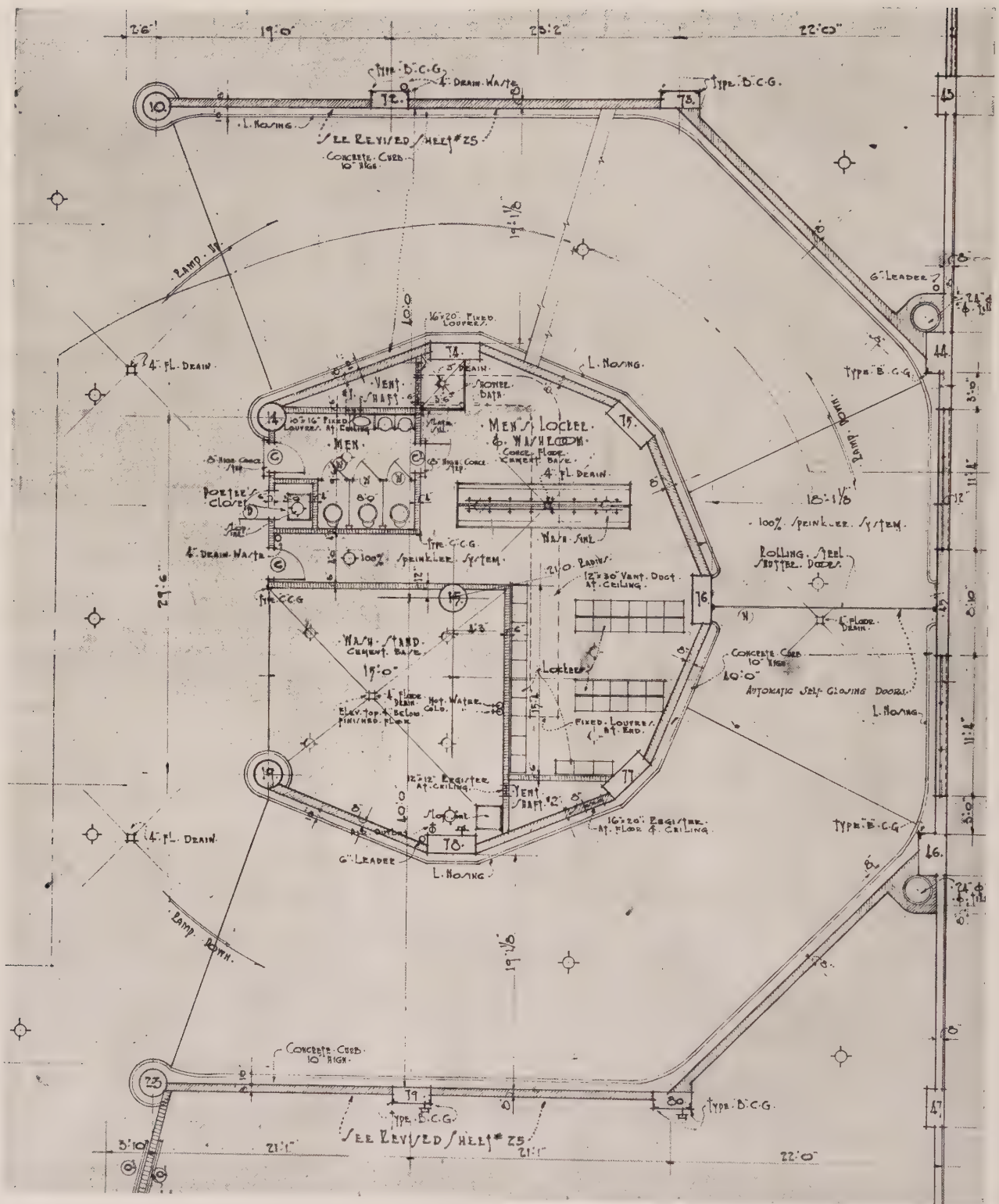
Industrial Building for Kahn & Feldman, New York
Buchman & Kahn, Architects



Elevations, Bank of Niagara, Niagara Falls, N. Y.
Carrere & Hastings, Architects, Shreve, Lamb & Blake, Associated



Plan of Bank of Niagara, Niagara Falls, N. Y.
Carrere & Hastings, Architects, Shreve, Lamb & Blake, Associated



Detail of Ramps in Building for Warren-Nash Motor Corporation, Broadway at 133rd Street, New York City
 Frank S. Parker, Architect

CHAPTER XI

GARAGES AND SERVICE STATIONS

PUBLIC garages must be so designed that automobiles can be handled with the greatest possible speed and that all cars are readily accessible, at all times. Cars come in with a rush at certain times of the day and go out with a rush at other regular hours, but in between the rush hours people are constantly coming and going, leaving cars and coming back, sometimes within the hour, to take them out again. The reasons for the requirements stated above are clear; in view of the nature of the service a public garage must render.

Getting the cars in and out as expeditiously as possible is a problem for which there are several solutions, applicable to different sets of conditions.

One way is to use ramps with straight runs between staggered floors, the floors of one-half of the service space being one-half story above the floors of the other half. This is an extremely good method, the use of which is increasing rapidly. The staggering of floors in connection with ramps is covered by a patent and the

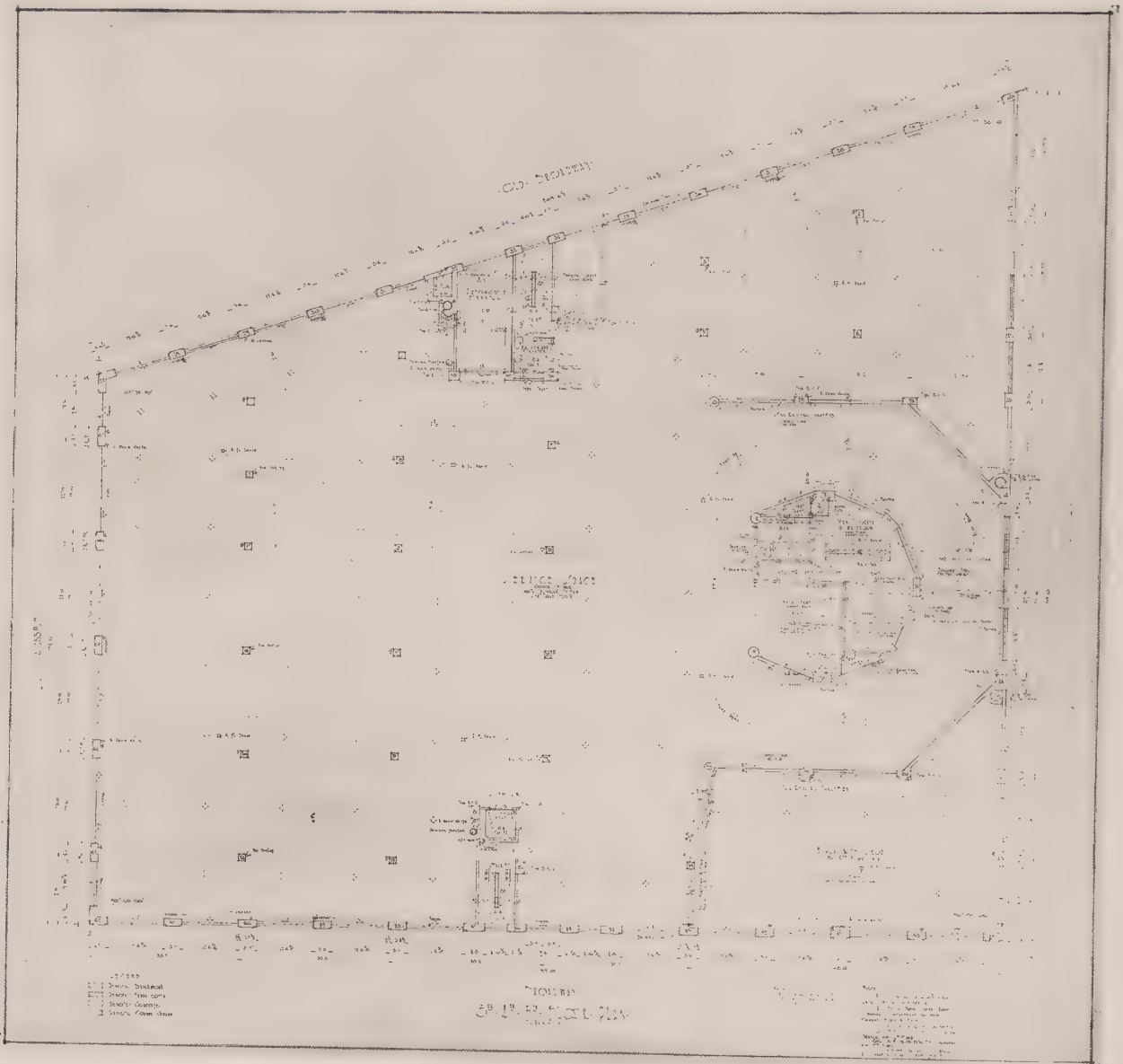
license to use the method is obtained from the owners of the patent. A good example of this type of design is the Motoramp Garages, Baltimore, Md., working drawings of which are shown herewith, pages 183, 184 and 185.

Another extremely good type is the system of "circular" or horseshoe ramps used in the building for the Warren-Nash Motor Corporation, Broadway at 133rd St., New York City. The design of these ramps is clearly shown in the detail reproduced at large scale from the plan of a typical floor of this building and the relation of the ramps to the service floor is shown by the entire floor plan, both of which are reproduced here—the detail on page 180 and the whole plan, at smaller scale, on page 182.

The use of automobile elevators is often desirable, instead of ramps, and an example of this method is the garage and service station for the Ortecar Realty Corporation, New York City. A typical floor plan of this building is reproduced on page 186, and the portion of this plan that shows the automobile elevators is reproduced at



Building for Warren-Nash Motor Corporation, Broadway at 133rd Street, New York City
Frank S. Parker, Architect



Typical Floor Plan of the Warren-Nash Motor Corporation's Building, New York City
Frank S. Parker, Architect

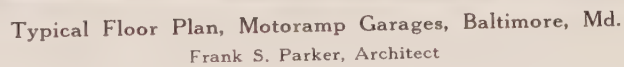
larger size, so that the detail may be seen more clearly, on page 187.

All of these ways are good, but where the conditions permit the use of ramps they afford greater speed in the handling of cars than is practicable with automobile elevators; this is especially true where the staggered floors are used in connection with ramps.

It is estimated that taking a car up or down in an elevator usually requires from two to three minutes. At the rush hours most of the traffic is in one direction, most of the cars coming in or most of them going out at about the same time. This means that the elevators do not carry a load both ways, usually. It is estimated that if an elevator carries twenty-five cars an hour it is doing well, while a system of ramps has the

capacity of a highway of the same width as the ramp. The cars can travel up or down under their own power in a steady stream. But there are cases in which it is not desirable or not possible to use ramps. The size and shape of the plot, or other conditions, may point to the use of automobile elevators as the proper method, and many garages of the best kind are equipped with elevators.

Cars can travel up or down on the same series of ramps with safety, if the ramps are properly designed. For instance, on ramps twenty feet wide, cars going in opposite directions can pass each other as safely as on a road of the same width and grade. In some cases ramps that are not wide enough to permit cars to pass are used for up and down traffic at the same time. In this



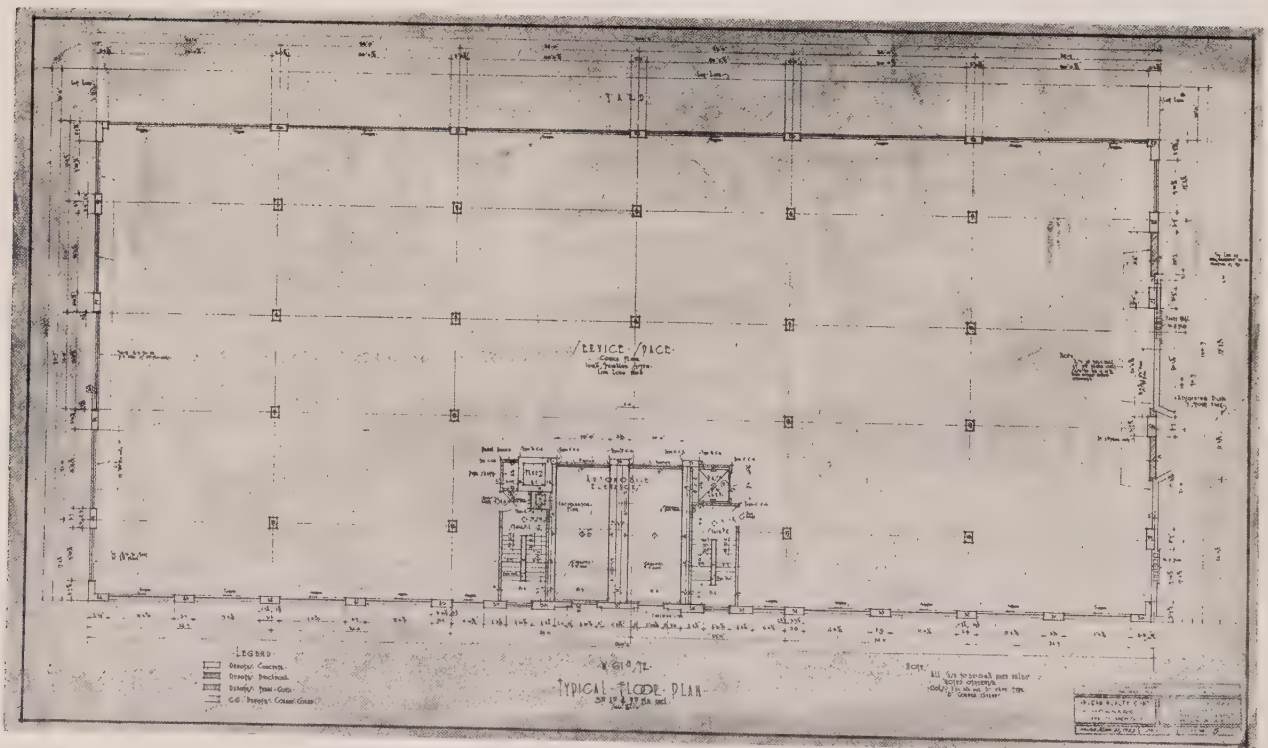
So far as the grade of ramps is concerned, it may be said that $1\frac{3}{4}$ in. of rise in 1 ft. of horizontal run is a good pitch, but ramps have been built with a grade of 2 in. rise in 1 ft. of run and have been found satisfactory. It is preferable not to make a ramp of greater pitch than

The importance of accessibility lies in the fact that if cars are stored in such a way that some of them are not accessible, those that are not easy to get out are quite likely to be wanted before the ones that interfere with their removal are taken out. This means delay, confusion and considerable labor, not the best kind of service or the most economical operation. The system of staggered floors which are connected by ramps is a great aid in securing the maximum of

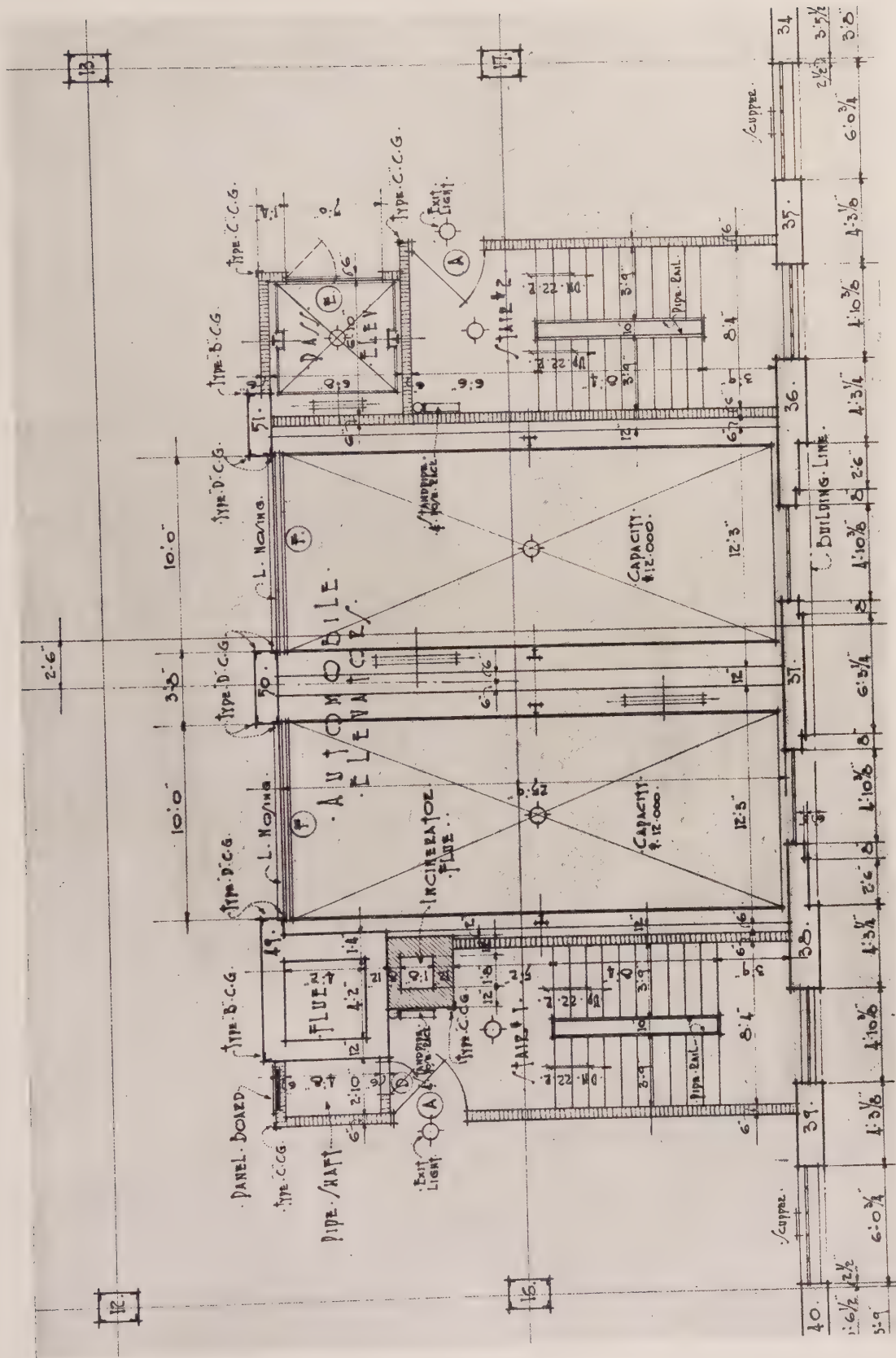
THE PRACTICAL REQUIREMENTS



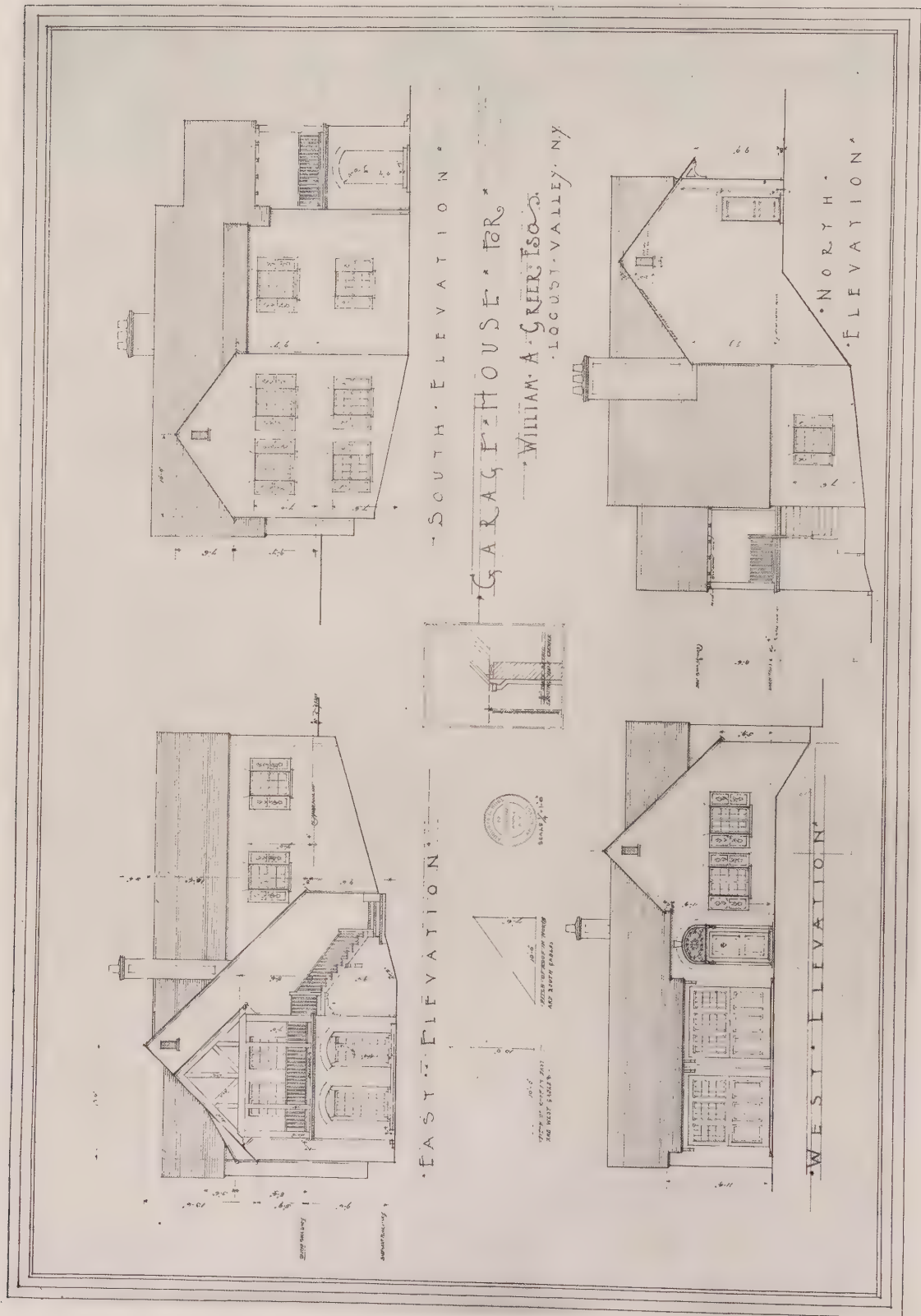
Garage and Service Station for Ortcar Realty Corporation, New York City
Frank S. Parker, Architect



Typical Floor Plan, Garage and Service Station for Ortcar Realty Corporation, New York City
Frank S. Parker, Architect



Detail of Automobile Elevators in Garage and Service Station for Ortcar Realty Corporation, New York City
 Frank S. Parker, Architect



Elevations of Garage-House for William A. Greer, Esq., Locust Valley, N. Y.
 Auguste L. Noel, Architect

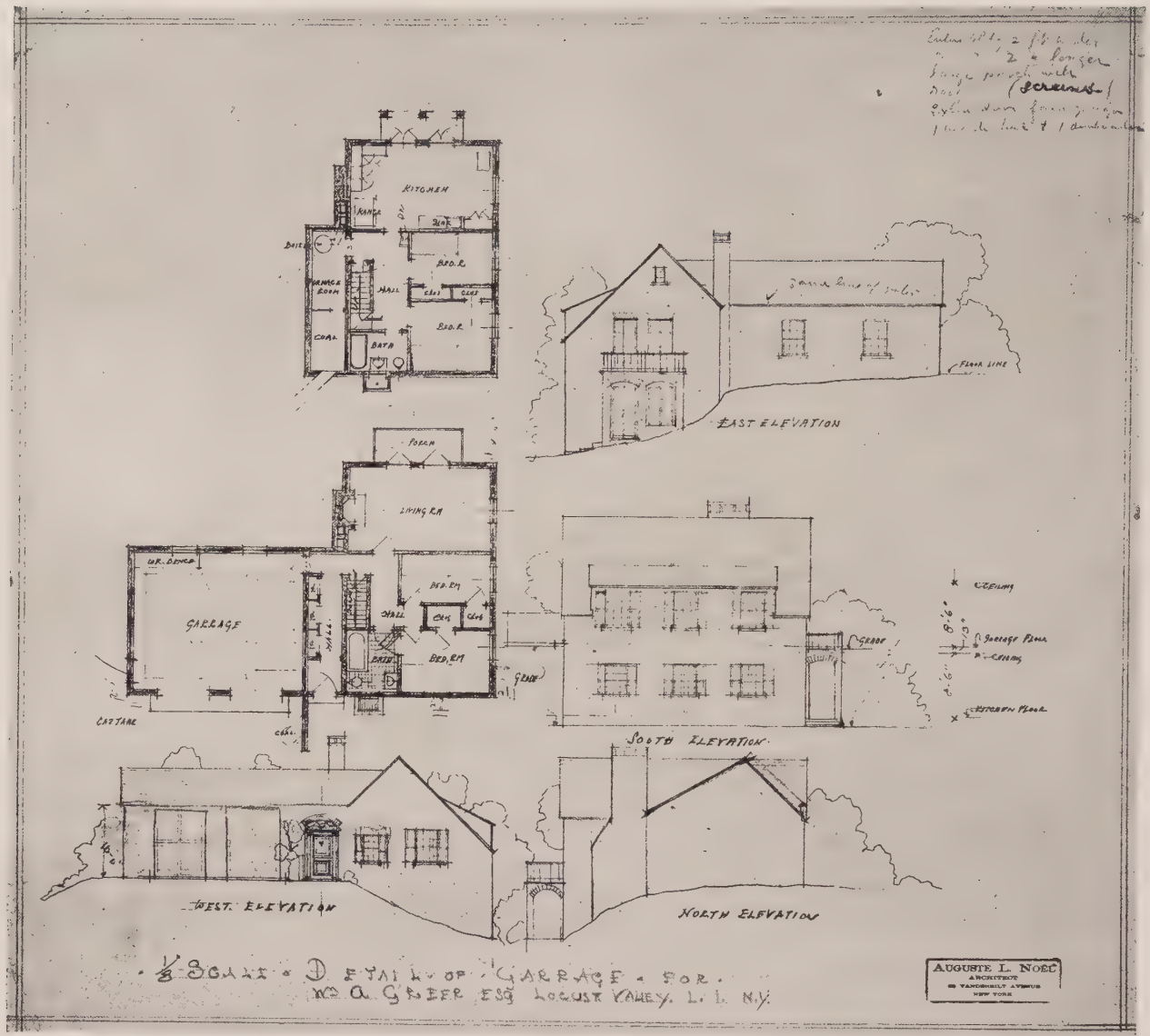
Architectural drawing of the ground floor plan of a garage house. The plan includes a large garage on the left, a central hall with stairs, a living room, two bedrooms, a bath, a vest, and a porch. Dimensions are provided for various rooms and overall sections. A circular stamp in the bottom right corner identifies the architect as Auguste L. Kohl, 82 Vanderbilt Avenue, N.Y.

GROUND FLOOR PLAN
Scale 1/4" = 1'-0"

GARAGE HOUSE
For
WILLIAM A. GREER, ESQ.
LOCHS VILLAGE, L. I.

AUGUSTE L. KOHL
82
Vanderbilt
Avenue
N. Y.
ARCHITECT

189



Garage-House for William A. Greer, Esq., at Locust Valley, New York
 Auguste L. Noel, Architect

CHAPTER XII

PASSENGER STATIONS

EXRESSED tersely, the purpose of a railroad passenger station is to take a man off the street, sell him a ticket and put him on a train; this sums up the practical requirements.

In order that this may be done expeditiously and without any undue sense of confusion, it is important not only that the station be planned conveniently, but that the architectural treatment be of such a nature that the man is led along the intended line of travel. This should be done by clearly announcing in the architectural design the purpose of each of the important features. For instance, on the exterior of the building, the entrance should be so clearly marked that there will be no need to search for it or even to give a second glance in order to find it upon approaching the building. Upon entering, the ticket office should be easily found, the entrance to the trains should be clearly marked. The passenger should not have to double on his course, and currents of people should not cross or meet head-on in restricted areas; circulation is one of the most important factors in this problem.

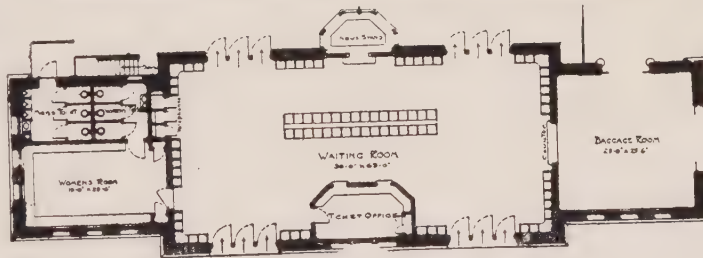
A bad example sometimes makes more clear the way in which a thing should be done. The writer recalls a station that is preeminently a bad example. One enters the building through inconspicuous doors and, having passed through a lobby, finds oneself in the waiting room, searching vainly for the ticket office, for the simple reason that this office is behind one. Having purchased a ticket, the traveler, naturally, looks about for the entrance to the trains. He might reasonably

expect to find it announced in some way, but the train entrance is cunningly concealed in the lower part of the wall, between the news stand and the baggage room. There is no architectural treatment to mark its location. To make matters worse, when the station was first opened, the benches in the waiting room were arranged in exactly the wrong direction, so that a passenger

leaving his bench for a train had to travel in a circuitous route. This has been changed, however, upon the advice of a practical railroad man. The disregard for the importance of expressing the practical requirements in the architecture, and of leading the public along the line of travel, is all the more to be regretted in this case because in other respects the building is excellent architecturally.

A good solution of this kind of problem is shown by the station at Bethlehem, Pa., of which Kenneth M. Murchison was the architect. By reference to the plan reproduced on page 195, it will be seen that the station serves two rail-

roads, namely the Philadelphia & Reading and the Lehigh Valley, and that it has been placed between the two roads. Passengers entering through the entrance lobby find the ticket office directly across the waiting room, in plain sight. Furthermore, the ticket office is announced by being made to project into the room on a curve. Then the passenger may turn to his right or left according to which railroad he wishes to take. It will be noted that the benches are arranged in such a way that their length is parallel to the line of travel; they do not block the way of passengers



Railroad Station at West Hempstead, L. I.
Kenneth M. Murchison, Architect

going to trains. A passenger tunnel extends under the railroad station as well as under the tracks of both railroads.

The same principles, of course, apply to very large terminals and to such small stations as are required in residential communities in the suburbs. An example of this type is the station at West Hempstead on the Long Island Railroad, of which Kenneth M. Murchison was the architect. In addition to the simple practical requirements of a suburban railroad station, the requirements called for living quarters for the station master in the building. The design of this station is in harmony with its surroundings in this suburban community, for it has much of the character of a country house, still it is clearly a railroad station. A reproduction of a perspective of this small station is shown on the preceding page.

The connection of the Union Passenger Station at Richmond, Va., with the railroad is shown by the track plan at the bottom of this page, and the admirable character of the architecture of the exterior is shown by the photographic view reproduced above. On page 193 is reproduced a plan of the main building, concourse and train

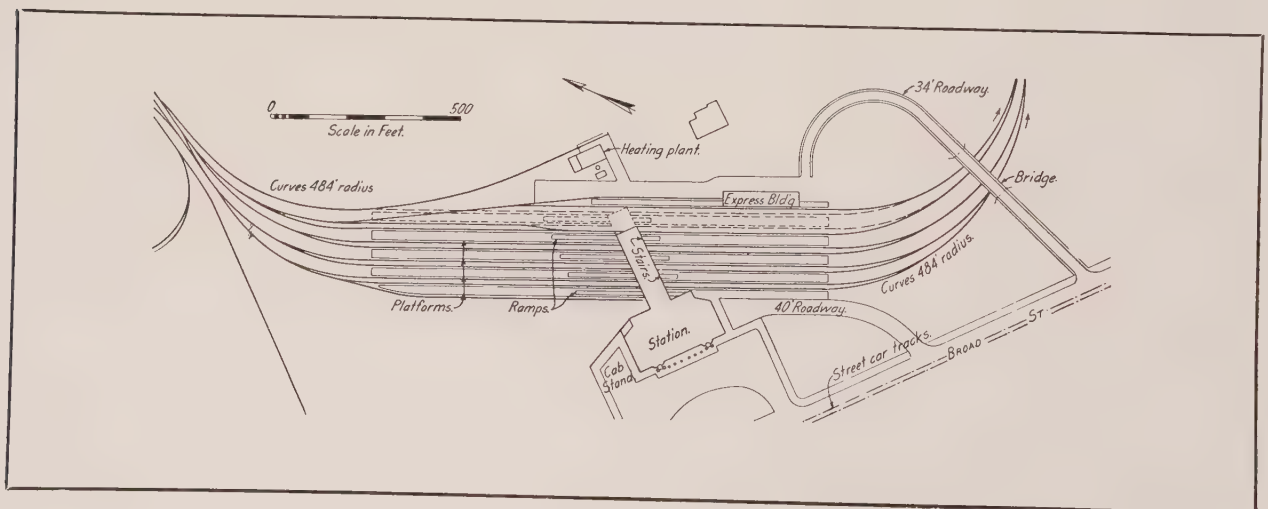


General View, Union Passenger Station, Richmond, Va.
John Russell Pope, Architect

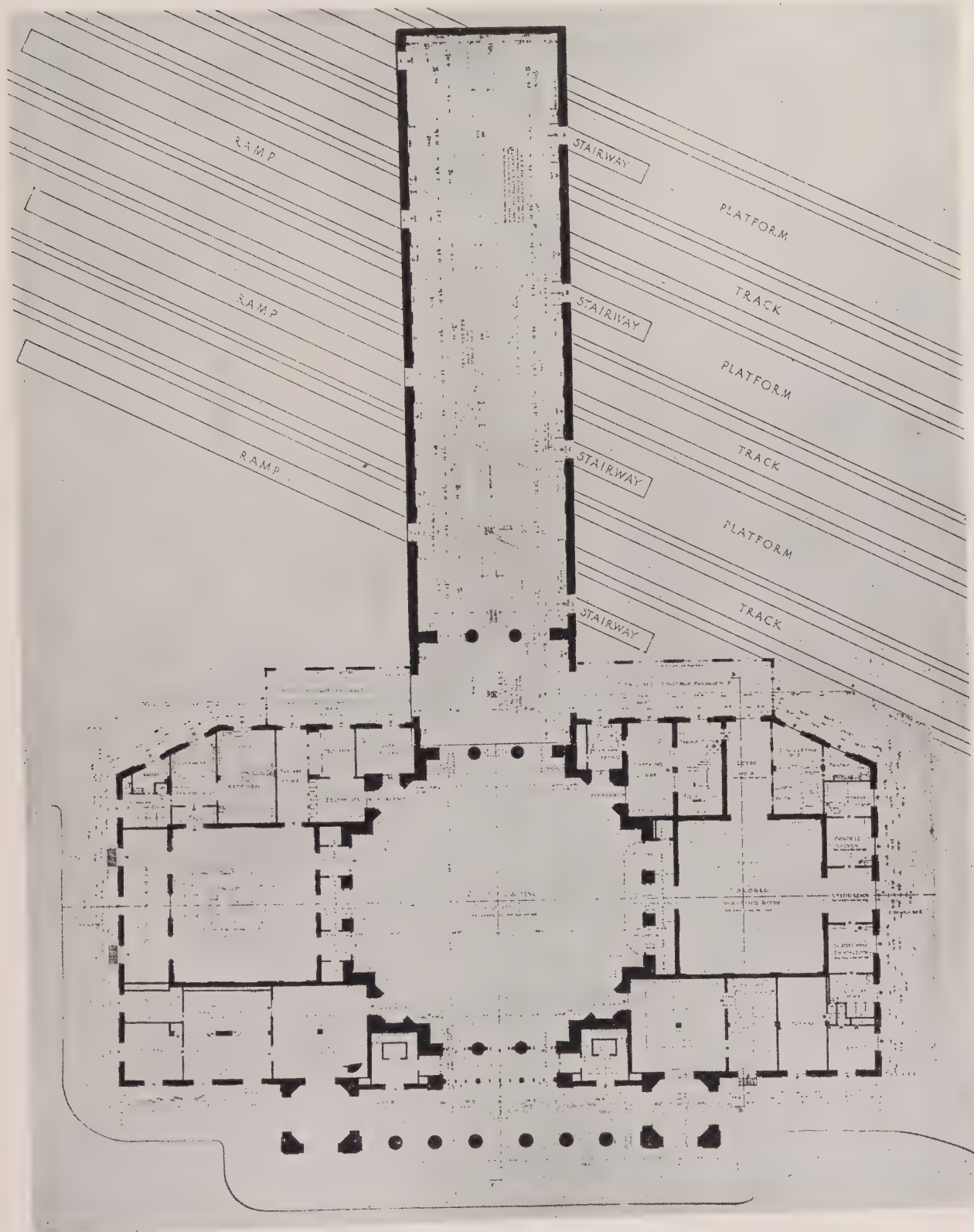
platforms of this station. The entrance is announced by a great colonnade across the front of the building and the vestibule opens directly into the main waiting room which occupies the center of the building. The waiting room is expressed on the exterior by the dome that crowns it. At the right is seen the colored waiting room—a local requirement—and at the left is the lunch room. The ticket offices are at the side where they are easily found. The way to the trains is directly opposite the entrance and is announced by the importance of its architectural treatment. Beyond the waiting room, towards the top of the plan, lies the concourse and beyond

that point are the stairways to the train platforms. Passengers coming from the trains find their way marked just as clearly. The various other requirements have been taken care of in a well studied arrangement about these main rooms.

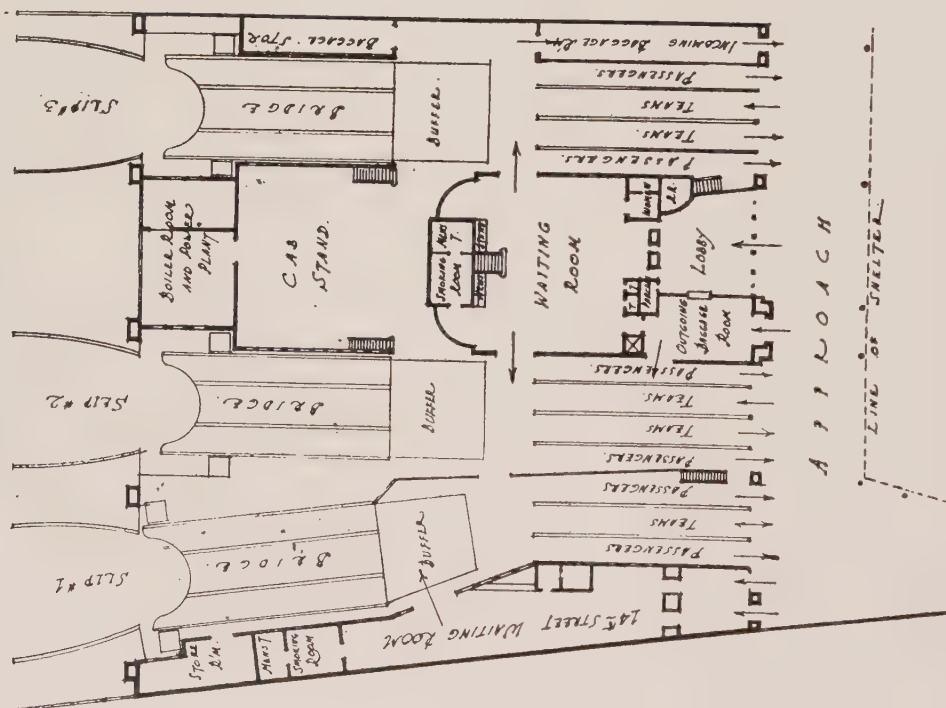
Ferryhouses are a type of passenger station that have their own special requirements arising from the effect of the shock of the ferryboats coming against the slip, which tends to develop cracks in the building. It is for this reason that these buildings are often covered with sheet



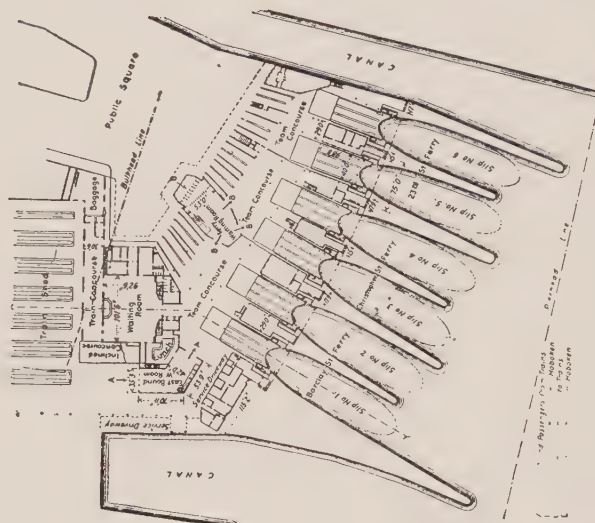
Track Plan, Union Passenger Station, Richmond, Va.
John Russell Pope, Architect



Plan of Main Building, Concourse and Train Platforms, Union Passenger Station, Richmond, Va.
John Russell Pope, Architect



Ferryhouse for the Lackawanna Railroad at Foot of West Twenty-third
Street, New York City
Kenneth M. Murchison, Architect



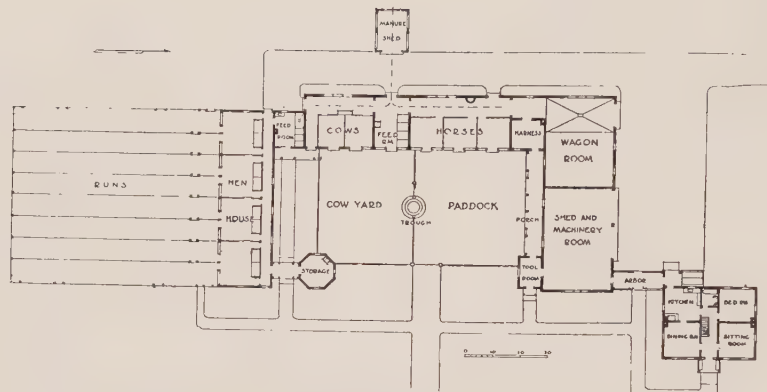
Hoboken Terminal of the Lackawanna Railroad
Kenneth M. Murchison, Architect

The piers of coastwise and trans-Atlantic ships, though large, are comparatively simple. Usually there is a pier at the ground level for freight and

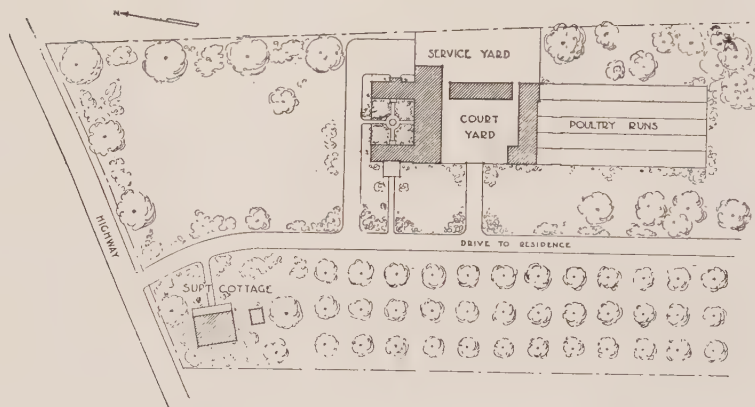
above this a second level for passengers. The building at the entrance to the pier usually contains elevators and stairways by which the upper level is reached and waiting rooms for passengers, small offices and various other minor facilities are required. Provision must be made for handling the different classes of passengers; first, second, and third class—and of course there are special requirements for means of making the ship fast and for gaining access to it, such as gangways, etc.



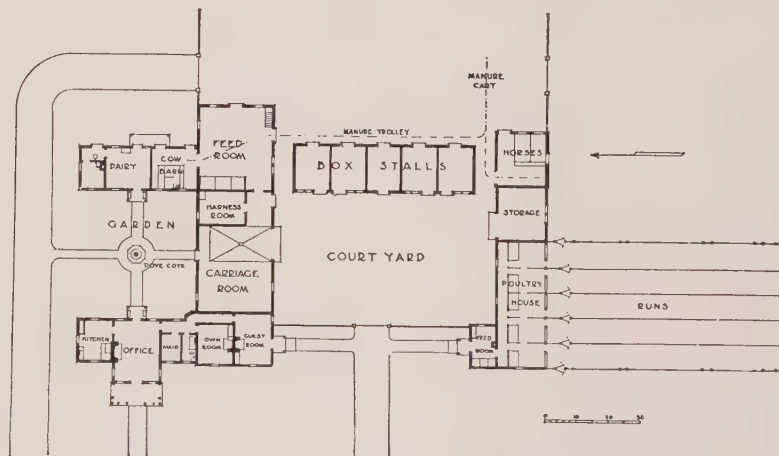
Joint Station at Bethlehem, Pa.
Kenneth M. Murchison, Architect



Farm Group on Estate of Adolph Mollenhauer, Esq., Bayshore, L. I.



General Layout of Farm Group for Glenn Stewart, Esq., Locust Valley, L. I.



Farm Buildings for Glenn Stewart, Esq., Locust Valley, L. I.

Farm Buildings and Layouts
 Alfred Hopkins, Architect, Charles S. Keefe, Associate

CHAPTER XIII

FARM BUILDINGS

THOUGH farm buildings range all the way from the small stables, cow barns and other buildings on private places of moderate size to the big cow barns, hay barns, etc., on the dairy farms that produce great quantities of milk for the market, the elements of their design are the same. The requirements of the dairy have set the standard for the equipment, and the equipment is the key to the plan.

The unit of equipment in a cow barn is the stall and the barn is in multiples of this unit plus the necessary passages and certain other parts.

The width of a cow barn is fixed by the space required for the stalls and since two rows of cow stalls, with the necessary alleys, take up about 34 ft. an outside width of 36 ft. is a good width for a cow barn.

The size of the stall and the width of the alleys are, of course, fixed by the size of the average cow and the working room needed about the stalls.

The stall floor is part of the concrete floor that extends from side to side and from end to end of the modern cow barn. The cow barn floor is united with the foundation walls that should extend at least 1 ft. 6 in. above grade. This makes the bottom of the building a big watertight tray with

all woodwork and other absorbent materials kept up away from anything that might cause them to become foul or wet. Cleanliness and dryness are two of the prime requisites in the modern healthful cow barn.

The stalls are arranged side by side in rows, usually, down the length of the barn. They may either face outward so that the cows have their heads towards the windows or inward so that their heads are towards the center of the building. In the former case there is a feed alley along each side wall and a litter alley (sometimes a driveway) through the center. When the cows face inward there is a litter alley or cleaning alley along each wall and a central feeding alley. This brings the gutters, back of the stalls, near the windows where they receive the direct sunlight and air needed in keeping them sanitary. Also the ventilation is much more effectively accomplished with this arrangement.

When the cows face inward there is no glare of light in their eyes from the windows and they are more contented because they can see each other. To anyone who is not acquainted with the cash value of contentment on the part of a milk-producing cow the latter consideration may sound sentimental. This arrangement also makes for



Farm Buildings on Estate of George S. Brewster, Esq., at Brookville, L. I.
Alfred Hopkins, Architect, Charles S. Keefe, Associate



Farm Buildings on the Estate of Glenn Stewart, Esq., at Locust Valley, L. I.

Alfred Hopkins, Architect, Charles S. Keefe, Associate

ease in feeding from the single central feed alley, and feeding is done oftener in the day than the cleaning out of litter.

On the other hand, when the cows face outward the mangers are near the windows and receive the sunlight that is valuable in keeping them sweet. There is convenience also in cleaning where one central alley serves two rows of cows. Where a disinfectant is used in the litter alley, it is more easily applied in one alley than in two. Also the central alley makes the use of milking machines more convenient.

The up-to-date cow stall has a concrete floor with a gutter at the back for droppings of manure, and a concrete manger at the front. Between the manger and the standing space for the cow are tubular steel posts connected at the top by a tubular steel horizontal from the center of which is hung a stanchion also of tubular steel. This stanchion is flexibly hung by means of links at the top; it is shaped to fit the neck of the cow, and is free to swing within limits, as the bottom is attached by a few links of chain to the curb of the manger.

The stanchion is a kind of elongated collar. In its best form it consists of two pieces of tubular steel, bent to a curve and hinged together at the bottom. These pieces are locked together about the cow's neck by a cow-proof catch at the top. When the cow is out, one side of the stanchion is held to one of the uprights by a "hold open guide." When the cow enters the stall, she thrusts her head into the stanchion, which is brought together and clasped by an attendant.

When the stall has double posts at either side of the stanchion, the cow cannot thrust her head through at one side, but must put it into the stanchion. When the stall has only a single post at either side, a tubular steel attachment called a "go-right" is sometimes fastened to the left-hand post of the stall to block the space at the side of the stanchion. None is needed at the right, as the arm of the open stanchion blocks that side.

There is also a type of stall that has a single post at each side and an additional light "side post" to serve the same purpose as a "go-right." The "go-right" is for attachment to "single-post" stalls as a means of remedying a fault of their construction. The single-post stall with "side post" has the remedy built in at the start. But the "double-post" stall, the type that has two posts at either side, is to be preferred. It is very strong and rigid, the cow must put her head into the stanchion and it connects well with the columns that support the floor above, the columns being placed in the stall line between the double posts. One great advantage of the double-post stall is the rigidity that is given the partitions between the stalls by their connection to the double posts, and this is important for the side strain upon a stall partition is severe when a cow throws her weight against it as very frequently happens.

The stall partitions, the railings at the side that separate each cow from its neighbors, are preferably of tubular steel bent to a quarter circle. This shape, known as the "single bend," is better than the old and well known "triple bend." The former is better because a cow cannot "ride" on it, possibly to her own injury, in entering the stall and it is more rigid. It is of better appearance; it lines up better for one thing.

Abortion is the dread of the dairyman and cleanliness, particularly in cleansing the cow pen after calving and in the handling and storage of feed, is of the utmost importance in combatting the spread of the germ that causes it.

The posts of the cow stall and the lower ends of the stall partitions should extend down into the concrete stall floor and should be built in place when the concrete is laid. Five inches into the concrete of the floor is the proper depth. The practice of setting anchors in the concrete and later attaching the posts is not so good because it is difficult to secure good alignment; there is not likely to be so much rigidity and the connections are dirt catchers. There should be no anchors,

couplings, or collars to foul on the stable floor. All couplings on a stall, even those high above the floor, should be of such design that they will offer the least possible lodging place for dirt.

It is best to set the columns that support the floor above (haymow floor) in the line of stall fronts, as this makes them pass through the curb of the manger, brings them up off of the floor. When they are set in the stall floor there are likely to be dirt-catching nooks between them and the manger curb, and the more clear the floor is the cleaner it can be kept.

The usual width for cow stalls is 3 ft. 6 in. Cows must not be crowded together and there must be partition rails between them, otherwise a cow standing is likely to tread upon another lying down, not infrequently causing serious injury to the udder or teats of the latter.

The gutter back of the cow stalls should be either 16 in. or 18 in. wide, 8 in. deep on the side towards the stall and 4 in. deep on the side towards the litter alley, with vertical sides.

A type of gutter known as the "fade away gutter" is sometimes used. Instead of having a vertical side next to the alley floor, it slopes up to the floor, and it is usually "undercut" on the side next to the stalls. It makes possible a narrower litter alley, since this gutter counts as part of the alley, but it is objectionable because cows are likely to slip on its slanting surface and injure themselves.

A typical manger for a cow barn is 18 in. high on the side next to the feed alley, with wall 3 in. thick at the top. A good width of manger is 2 ft. 6 in. from the inner edge of the wall next to the feed alley to the center of the curb next to the cow. This curb should be 5 in. high above the stall floor. Sometimes it is built up to 11 in. high at the sides, with a curved space cut down to 5 in. for the bottom of the stanchion in the center. The built-up curb is better than the low curb as it prevents feed from being thrown out of the manger

by the cow and wasted. The inner surface of the manger is curved and should be built to a form that will fit the sheet steel divisions that are to be used information being obtained from the makers.

The mangers in front of a row of stalls form a continuous trough that should be cut up into separate mangers by division plates of galvanized steel so hinged that they can be raised for cleaning the manger. Five divisions can be raised by one connecting bar that also gives them rigidity, or they can be arranged to operate separately.

The manger should be provided with drains so that it may be flushed down, as well as swept out. These drains should be buried in the concrete stall floor and should open upon the gutter at the back of the stalls. The gutter should have trapped drains, of ample size connecting with soil pipe or tile drainpipes set only 2 in. under the surface of the alley floor, for ease in cleaning in case of stoppage. There should be a clean-out hole with brass stopper, not threaded, in every gutter drain head, making it possible to introduce a stiff wire, a slender rod or a reed pole into the drainpipe for the purpose of removing any obstruction.

Cleanliness is one of the most important considerations in cow barn equipment, for the importance of clean milk is beyond question. It is for this reason that wood should be avoided in stall construction. Cleanliness not only makes for clean milk, but for the maintenance of the health of the herd.

Though the stanchion, if of proper design, permits ample freedom of movement for comfort, it holds the cow in her place. The width of the stall platform is such that the droppings are received in the gutter, and the platform upon which the cow lies is not soiled. This is the most important factor in keeping the cows clean.

Since cows are not all of the same length, some provision must be made for adjusting them in alignment. A small Jersey cow will fit a platform 4 ft. 4 in. from manger to gutter, while a



Farm Buildings on the Estate of Adolph Mollenhauer, Esq., at Bayshore, L. I.
Alfred Hopkins, Architect, Charles S. Keefe, Associate



Farm Buildings on the Estate of Glenn Stewart, Esq., at Locust Valley, L. I.

Alfred Hopkins, Architect, Charles S. Keefe, Associate

cow of the larger Holstein breed may require a platform 5 ft. 4 in. wide.

The architect should know what breed of cows he is designing a barn to accommodate. Since there are seldom cows of different breeds in the same barn, the difference in the length of the cows in any given herd is not likely to call for so great an adjustment as the extreme of one foot difference between the depth of the stalls required for the different breeds mentioned above.

Cows, even those of the same breed, differ in size somewhat, and it is important that they be perfectly aligned on the gutter, so various means have been devised. The best way is to graduate the width of the stall platform, making it a few inches wider at one end of the barn than at the other end. A stall that will fit the length of each cow can then be found and the cows will be graduated in size along the row, presenting a better appearance than when cows that show a considerable difference in size are placed next to each other.

It is very much better to graduate the width of the stall platform than to use any means of adjusting the stanchions back or forward. What really counts is the distance between the manger and the gutter. The cow will slide her neck back and forth through the stanchion and placing the stanchion back or forward of its normal position, which is directly over the curb of the manger, has little effect excepting to cause the cow some inconvenience and discomfort. Injury to the cow

may even result from the use of a stanchion adjuster of incorrect design, just as injury may be caused by a stanchion that is not of proper form.

A question upon which there is a marked difference of opinion is whether or not the floor of the feed alley should be at about the level of the other floors, approximately 18 inches below the top of the manger, or elevated to the top of the manger. Those who favor the latter arrangement contend that it is much easier to feed from a raised floor. Another consideration is that the appearance of the cattle when viewed from the elevated floor is better. On the other hand, the objection is made that with the raised feed alley the hay is handled from the floor of the alley and is consequently likely to be soiled. Some maintain that this is a means of spreading infection, and that it frequently results in a cow losing her calf. Another objection to the raised feed alley is that it necessitates steep ramps in the cross-over passages, and all steep slopes should be avoided. The author strongly favors the low feed alley.

Though the dairy barn with two rows of cows either facing inward or outward (and the writer prefers the former arrangement) is the usual thing and though such a barn usually has storage space for hay above the cow stalls, this type is not always the right one to use, for sometimes it is better to build the cow barn without storage space above and to put up a separate building which will shelter the hay. This can be done for less money. A cow barn, unless for only a few

cows, should not have a single row of stalls because of the proportionately greater construction cost per animal.

Barns have sometimes been built for four rows of cows—two rows facing inward and with one row at either side facing outward, making the two litter alleys serve four rows of cows. But the extra construction needed because of the width is likely to cost more than is saved on the side walls. And, above all, a barn with four rows of cows is not as good for the cattle, for the center two rows are so far from the windows that they do not receive good light and air and the ventilation is difficult. Sunlight does not reach the middle of the barn. The value of sunlight is beyond question.

Cow barns should be well ventilated. The fresh air should be delivered in front of the cows and if they face outward the arrangement described below should be reversed. An excellent system is that which delivers fresh air at the center of the ceiling, in a cow barn where the cows face inward. In this system, the fresh air intakes are in the sides of the building placed sufficiently high so snow will not close them in winter and flues are built in the side walls and in the ceilings of the cow barn, on the under side of the haymow floor. The foul air is removed through a set of flues having their openings near the floor and discharging above the roof of the barn. Each foul air flue should extend at least 2 ft. above the roof and should have a ventilator cap to keep out the weather.

In order that any system of ventilation may function it is necessary that the building be tight so that all air currents must pass through the channels provided in the ventilating system. Cracks in the siding, under the doors, ceiling, or any other place that will admit air to an appreciable extent, will reduce the effectiveness of the ventilating system in just that degree. It often does not take much leakage to prevent a system from functioning. As the operation of most types of ventilation is dependent upon the difference between the temperature indoors and that outdoors the ventilating system works most effectively when needed, during the winter months. During the other months of the year, when the temperature outdoors is almost the same as that indoors, the barns may be ventilated with comparatively little risk, by means of open windows and doors. But it is well to provide shields of galvanized steel which permit the windows to be tilted inward, for ventilation without creating a direct draft. These shields can be had ready to install. The same need exists for good ventilation in cow barns that exists in buildings occupied by human beings, but to a greater extent because of the large amount of moisture given off in the breath of cows. In cold weather, the moisture from the cows' breath condenses on all cold surfaces in the barn and causes

a condition that is commonly known as sweating.

As dairy barns are usually warmed only by animal heat from the cows, it is important that ceilings be of moderate height and that the walls be of a nature that will keep out the cold. A good height of ceiling is 8 ft. In southern states the ceiling should be higher and there should be a monitor or other means of letting out the heated air in summer. A wood frame barn, if tightly built, is warmer than a barn that has a masonry wall. Hollow concrete blocks, hollow terra cotta blocks, or concrete with air space makes a good, warm wall. If masonry walls are used, it is well to fur the inside and sheath with matched lumber or to fur, lath, and plaster the interior.

An excellent means of insulating the floor of cow stalls is to lay an underfloor of hollow tile, finishing with concrete on top of it. Hollow tile blocks may well be built into the floor, also, where the floor joins the foundation wall, to prevent dampness. A warmer and more generally comfortable stall floor may be made by using cork brick on a concrete base on top of the tile blocks. The cork bricks used, even without tile, are better than a floor of plain concrete. Cork bricks are made from ground-up cork, compressed with asphalt, coal tar pitch, etc. They do not absorb moisture, they are resilient and the tar tends, it is said, to act as a germicide.

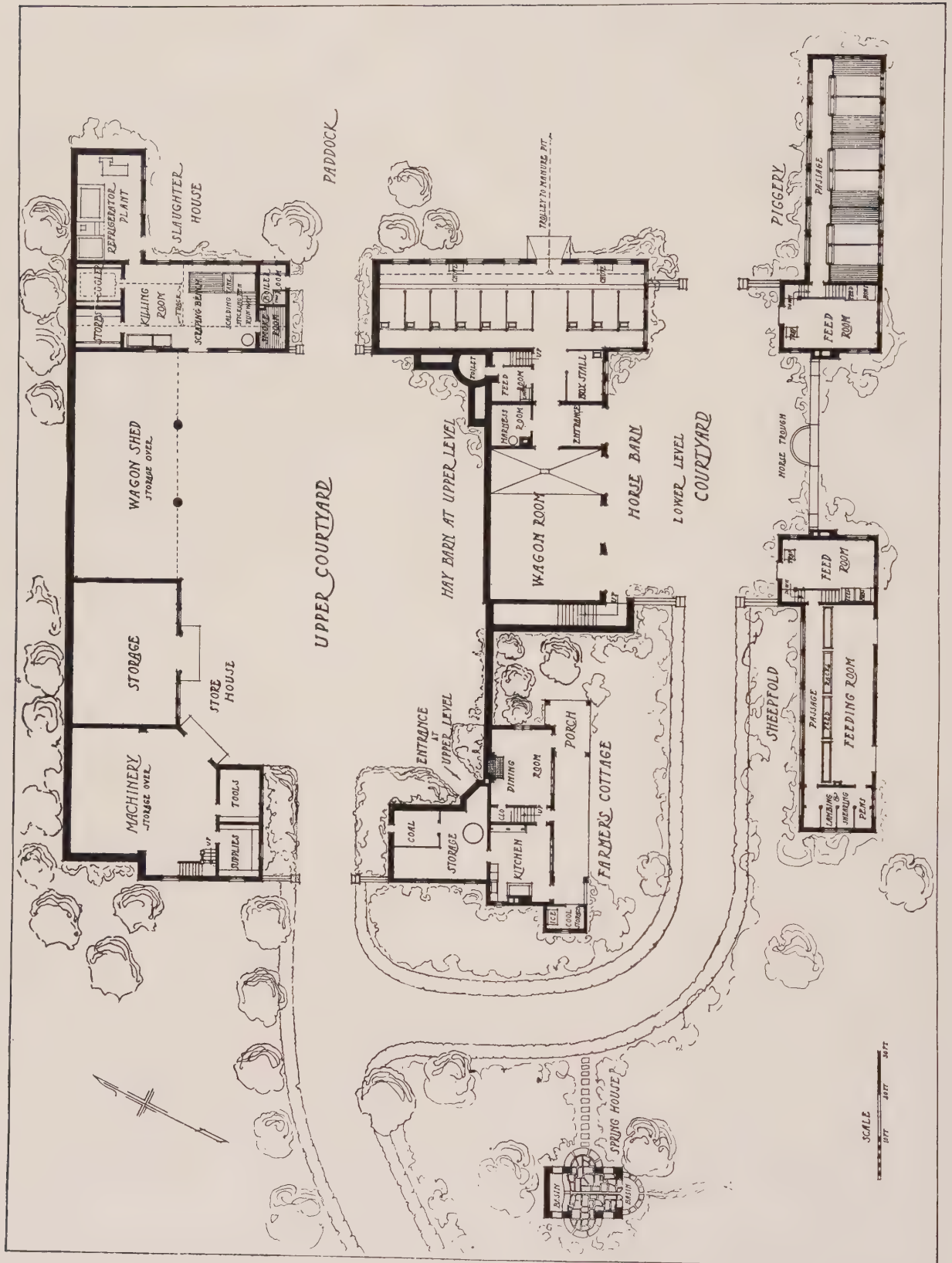
One of the aims in the construction and equipment of up-to-date cow barns is "cow comfort," and this should be kept in mind by the architect throughout the designing of buildings for housing of cattle, particularly for dairy cows. It is now understood that the cow that is comfortable gives the greatest yield of milk.

In this connection, it is well to recognize a comparatively new item of equipment, the individual drinking fountain for each cow. The cow operates it by pressing with her nose on a plate in the bottom of the bowl. This gives the cows the greatest comfort, for it enables them to drink when thirsty, instead of waiting until they are taken for water, and it is actually profitable—having plenty of water a cow produces plenty of milk. There is an additional saving on labor cost of a man watering the cows.

A cow barn requires, in addition to the stalls, at least two cow pens in which a cow may be kept without fastening at calving time. Calf pens are also needed, and a bull pen for the herd sire.

The best type of cow pen is built of tubular steel uprights, set solidly through a concrete curb into the concrete floor and connected at the top by a tubular steel rail. This construction is stronger and more easily kept clean than a pen that has a bottom rail with only the corner posts and gateposts set into the concrete. Either a concrete corner manger or a tilting manger of galvanized iron is good. It is especially important that the cow pens be of such construction that they can be

THE PRACTICAL REQUIREMENTS



Farm Group for Charles M. Schwab, Esq., at Loretto, Pa.

Murphy & Dana, Architects, Charles Wellford Leavitt, Landscape Engineer

cleansed after calving to prevent infection.

Calf pens should be enclosures of tubular steel with certain of the verticals hinged at the bottom so that they act as stanchions, the calves thrusting their heads through the railing into the feed trough where they are held by their necks by the closing of the stanchion bars. The feed trough should be outside the pen and it is desirable to have galvanized sheet steel divisions, like doors, hinged to the outside of the pen to keep the calves from reaching each others food at feeding time.

The bull pen, naturally, needs to be of very strong construction. An excellent type of bull pen has an enclosure made of steel tubing, every horizontal extending through a curb 5 in. high down into the concrete floor, to a total depth of 9 in. and rising to a height of 5 ft. 3 in. above the floor. The gateposts are tall enough to allow head room under a horizontal connecting rail of tubular steel which gives rigidity to the posts. There should be a corner manger of concrete with a small door for feeding and a stanchion at the manger so that the bull can be fastened when it is necessary for a man to enter to clean the pen. The gate must have strong latches that lock automatically and that cannot be opened by the animals; these precautions are highly important.

There should be an overhead track in the feed alleys and litter alleys for the litter carrier and the feed carrier. These tracks should be provided with switches and should have branches running to the silo, feed rooms and, supported on a line of posts, to the manure shed or pit. Sometimes a swinging boom is arranged for the litter carrier so that the manure is spread on a heap, in other cases a rod is used for the carrier to run on out of doors but a track to a manure pit is preferable.

Just as the housing of cows has been developed upon a scientific basis, so the housing of hogs has been improved and the present-day hog house is clean, dry, filled with sunlight, and provided with attractive equipment.

The hog house should extend east and west, with windows in the south wall and skylights or other means of admitting sunlight besides. Sunlight is especially important at the farrowing season, and March 1st is taken as the date, for convenience, in making calculations of the sunlight pattern on the floor, by which the amount of sunlight that reaches the interior is determined.

A typical hog house has a central feeding alley running the entire length of the building from east to west, with a row of pens along the south wall and another row along the north wall. The space of one pen, in the northerly row, may well be utilized for a storeroom and heater. A hog house in which a number of pens are grouped in this way is sometimes called a "community hog house," and much thought is given to it.

A good size for hog pens is 8 ft. x 8 ft. 4 in. with feed alley 6 ft. wide. The pen should have

a cement floor, forming part of the floor of the house, and each pen should be bounded by a cement curb 5 in. high. It should be enclosed on three sides by a fence, 3 ft. 6 in. high of tubular steel, with corner posts set in the concrete floor. It should have top and bottom rails attached to these posts, holding vertical "fillers" spaced 3 in. or 4 in. on centers. The wall of the house forms the fourth side of the pen.

On the side next to the feed alley there should be a gate in the enclosure and opposite to this in the wall of the building, there should be a small "hog door" opening into the yard that is enclosed by a fence. Next to this door there should be a pair of windows.

A portion of the floor about 6 ft. x 6 ft. lying along the westerly side of each pen and next to the wall should have a surface of cork brick. This is the "nest" or bed of the sow and pigs. In this position it is sheltered and the nests are separated.

Near the floor there should be tubular steel rails, supported on short horizontal arms, to provide a place of refuge for the small pigs, otherwise there is danger that the sow may crush them by inadvertently rolling on them. These pig guards should be so constructed that they can be folded up out of the way when the pigs grow old enough so that the protection of the guards is no longer needed and the space is required by the growing pigs.

The feed trough should extend along the feed alley from gate to gate. It may be formed either of concrete, as a part of the floor, or of sheet metal.

In order to avoid difficulty in filling the feed trough, owing to the proverbial greediness of pigs, it is desirable to have either a swinging panel in the fence over the cement trough or a sheet metal trough with a lip extending into the alley for ease in filling. The swinging panel is hinged at the top and when pushed inward keeps the pigs out of the trough while the food is being put in. A sheet metal trough can be had that tilts by pressing a foot lever, so that it may be cleaned. The writer prefers the cement trough with swinging panel above it. There should be an overhead track in the central alley for the swill carrier, etc.

Making the length of the hog house east and west with windows in the south wall takes care of the need for sunlight fairly well so far as the southerly row of pens is concerned, but those along the north side must be provided with the much needed sunlight by other means. Consequently, skylights are placed in the roof to admit sunlight to the northerly pens. There should be no windows in the north wall, as they could not admit sunlight and would make the house cold. There must be hog doors in the north wall opening into enclosed yards.

A type of roof that is excellent for the hog house is the gambrel roof of rather flat pitch, coming down to the tops of the hog doors and with glass



Farmer's Cottage



Wagon Shed

Farm Group for Charles M. Schwab, Esq., at Loretto, Pa.
Murphy & Dana, Architects, Charles Wellford Leavitt, Landscape Engineer



Detail of Farm Group for Adolph Mollenhauer, Esq.,
at Bayshore, L. I.

Alfred Hopkins, Architect, Charles S. Keefe, Associate

skylights in both the lower slope and the upper slope, the former giving additional light to the southerly pens while the latter admit sunlight to the pens of the northerly row.

There are many other types of roof that are used on hog houses for the purpose of letting in as much sunlight as possible particularly during the latter part of the winter and the spring. Among these is a roof that is very much like the "saw tooth roof" used on some factories, or the familiar studio skylight. But the gambrel roof is simple, of good appearance and free from the disadvantages that attach to most, if not all, of the other types. The gambrel roof is particularly good when it is fitted with a special type of window that has a thin frame of metal that does not obstruct the sunlight, as an ordinary frame does, and that is weathertight.

In stabling horses, the same general arrangement that is used for dairy barns is good—that is, two rows of stalls. The same general conditions apply, though in horse barns it seems to be more often desirable to face the horses outward, with the litter alley in center, and feed alleys along the walls. In horse barns there should be a box stall for occasional use when a horse is ill, and there should be a harness room.

Cows and horses should not be kept in the same barn, where the object is the production of clean milk for the market. When both cows and horses are to be taken care of, there should be built a two-section barn—the cow section being separated

from that of the horses by a feeding room extending across the building and cutting the building into practically two buildings. With this arrangement the litter alley and feed alley can be made to match. The silo may be placed at one of the transverse alleys of the feeding section, adjoining the feed room, which should receive feed by chutes from a storage room above. It is not necessary, however, that cows should face outward, because the horses do, as a different arrangement of alleys may be made.

The feed room should be large enough for grinding and mixing feed, and a bin for oats and other grains should be placed where it is convenient and there should be a water trough.

In a horse barn, 5 ft. should be allowed for the width of each tie stall and 8 ft. 5 in. for each double tie stall, and 9 ft. to 12 ft. for each box stall.

A calf pen should be 7 ft. to 10 ft. wide; the cow pen should be 9 ft. to 12 ft. wide; and the bull pen 10 ft. to 14 ft. wide. A central feeding alley is needed in each pen section. The horse stalls may be made to face a single feed alley, if desired, or they may face outward.

Basement or "bank" barns are sometimes built where the contour of the ground is such that it is convenient to use this type. This permits of wagons being driven in at the level of the mow floor, and the storage bin for mill feed and grain can be located between the hay chutes. The barn should not be set against the bank, but should be reached by a bridge, to avoid dampness.

Where only a few cows are kept, say six, a cow barn with a litter alley on one side and a feed alley on the other side may be built. Even in so small a building, the stall equipment should be the same as in a large barn and the floor of concrete. There should be a passage at least 3 ft. wide connecting the litter alley and the feed alley. A good ceiling height for so small a building is 7 ft. 6 in.

A milk house should never be included in the same building with the barn on account of dust and dirt. It should be a separate building placed near the barn, but not connecting with it. The size depends on the quantity of milk handled. Where bottling is done, a larger area is required and for butter and cheese making still greater space is required.

A small milk house may be 10 ft. x 20 ft., one story in height, and from this size upward according to the equipment it must have. The simplest milk house has three rooms: a room with fuel bins at one end; a wash room, containing a sink, drain board and can rack, also a tester; the third room or milk room at one end, with cooling tanks, cooler and separator. Where more extensive equipment is required, it is a matter of so much detail that it is a subject for special study.



Lion House, Lincoln Park, Chicago, Ill.
Perkins, Fellows & Hamilton, Architects

CHAPTER XIV

PARK BUILDINGS

THE buildings in public parks, including music stands, comfort stations, and various other structures have requirements of a highly special nature. The most common park buildings are the ones mentioned, though occasionally other buildings are needed; for instance, those in which to house animals of a zoo, a boat-house, a building in which the equipment for playing lawn tennis may be kept, administration buildings, etc.

The one of these structures that presents the most exacting requirements is the music stand or band stand, because its proper design involves a difficult problem in acoustics. Such a band stand must be so designed that it will project the sounds produced by the band over a wide area, and it must accomplish this without producing interference of sound waves or any effect that will reduce the purity of tone or disturb the relative values of the musical notes of the various instruments. It must, in brief, send the music out to a large assemblage of listeners in the open air with clarity and without loss or distortion. This part of the problem of designing a music stand calls for either the assistance of someone who has worked out a similar problem successfully or for thorough scientific research on the part of the architect. An outstanding example of the successful designing of a building of this kind is the band stand on the Mall, Central Park, New York City, which

was designed by Tachau & Vought, architects.

Through the courtesy of the New York City Park Department and the architects, working drawings of this music stand are published herewith. See pages 209-212.

The architects have solved the complex problem in acoustics so successfully in this instance that the crowds that assemble on the great Mall and people at a distance in the surrounding area of the park hear the music perfectly. Though intended only for band concerts this stand has stood the unusually severe test of projecting the music of an orchestra clearly and faithfully. Hitherto it has always been considered practically impossible to present orchestral music satisfactorily to a large assemblage in the open air.

This building is of reinforced concrete construction faced with stone. Its building as well as its design involved many difficulties, because of the very exacting requirements connected with securing the desired acoustical properties.

Of course, most music stands in parks do not represent any

such effort, or produce a like effect. They are most often simply shelters of more or less pleasing design, with floor space for the band and they show very often only the most casual recognition of the need for special acoustical properties. No attempt seems to be made usually to design them scientifically, though the importance of this



River Front



Looking Towards the River

Shelter and Comfort Station in Carl Schurz Park, New York City
Charles Schmieder, Architect

is clear enough. It may be noted that this stand has ample space for seventy musicians.

Perhaps the most common of park buildings, since they are needed in the small parks and squares throughout a city as well as in the large parks, are the comfort stations. These are sometimes separate buildings and at other times they form part of a shelter pavilion or other park building. Occasionally they are built entirely underground, with stone steps leading down to them and a chimney-like, but unobtrusive, stack for ventilation. When an underground comfort station is located in a park of considerable size it is possible to secure ventilation and light by the use of windows in trench-like areas around it. These are concealed by the planting. When an underground comfort station is located in a small square practically along the sidewalk it is often not possible to make use of areas. Gratings in or along the sidewalk would not be satisfactory because of the odor of disinfectants, etc., arising through them. When they are at some distance from a walk, as they are in a park, usually, this objection does not hold. An underground comfort station requires a sewage lift to bring the sewage up to the sewer level, usually. This device, though it may be mechanically good and effective in operation, is often subjected to abuse by attendants and is likely to suffer for lack of intelligent care. It may then become a source of trouble. Though comfort stations must be built below the surface of the ground in the congested parts of cities, this is to be avoided whenever possible. Aside from the features already mentioned an underground comfort station need not differ in equipment from those above ground.

Since comfort stations should be built above the surface of the ground whenever this is possible, drawings of such buildings rather than those of underground comfort stations have been chosen to illustrate this chapter. By permission of the New York City Park Department, two comfort stations designed by the architect of the Department of Parks and recently built are shown by working drawings on pages 213 through 222.

In general it may be said that a comfort station should have an entrance vestibule with a room for the attendant adjoining it. This room should have a window and a glass door looking out upon the vestibule so that the attendant may observe the persons passing in and out.

A comfort station above the ground should have high windows, high enough so that people passing cannot see in and so that the windows come above the level of the tops of the water closet stalls; 6 ft. 6 in. or 7 ft. above the floor is a good height.

The floors are preferably of tile and the walls are best covered with tile to the height of the tops of the water closet stalls, but cement floors and

cement dado cost less and are good. Above the dado, the walls should be painted in some light pleasing color, say cream color, or light buff. The ceiling should be painted a lighter tone of the same color.

Windows that are hinged at the bottom to open inward have proved best. They should be glazed with clear glass. The interior should be bright, airy and of pleasant appearance.

The best material for water closet stall partitions in comfort stations is marble; it is not costly, is easily kept clean and is of good appearance. Metal stall partitions are sometimes used; they cost less.

Water closets of the "prison" type, of heavy porcelain with integral seats, are well suited to this purpose. They have no separate seat, the porcelain of the closet bowl being molded to such shape as to serve as a seat. It has been pointed out that the integral seat of porcelain is cold and that while it can be kept clean it is not necessarily so. Vandalism has to be guarded against, however, and hinged seats are more easily damaged. A type of flush valve that is operated by pressing the foot on a button set in the floor is well adapted to use in comfort stations. It does away with the necessity for touching a lever with the hands and is therefore more sanitary. It is also much less subject to damage than an exposed lever.

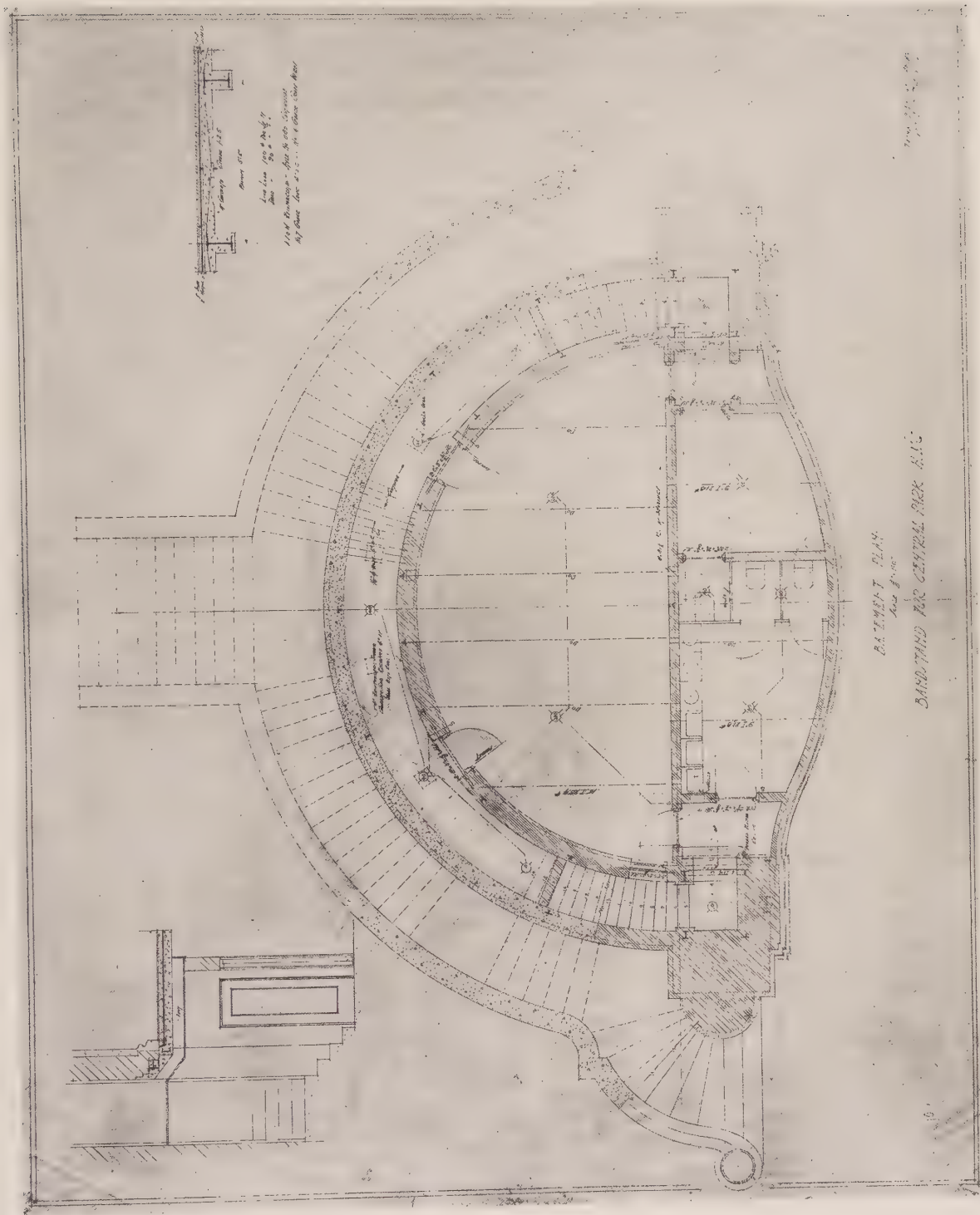
Urinal stalls cast of porcelain and so made that when they are set they interlock, forming a row without the exposed joints that result from the unavoidable irregularity of the edges of such stalls when they are simply set side by side, should be used.

There should be a hand bowl, with faucet closed by a spring, and preferably operated by depressing a button at the top. The button is less liable to damage than a wheel or lever, and the faucet must have spring action in order that the water may not be carelessly wasted or caused to overflow the basin in case of stoppage of the drain. The hand bowl should have a hose bib to which may be attached the hose, of the size of an ordinary garden hose, used in washing down the walls and floor.

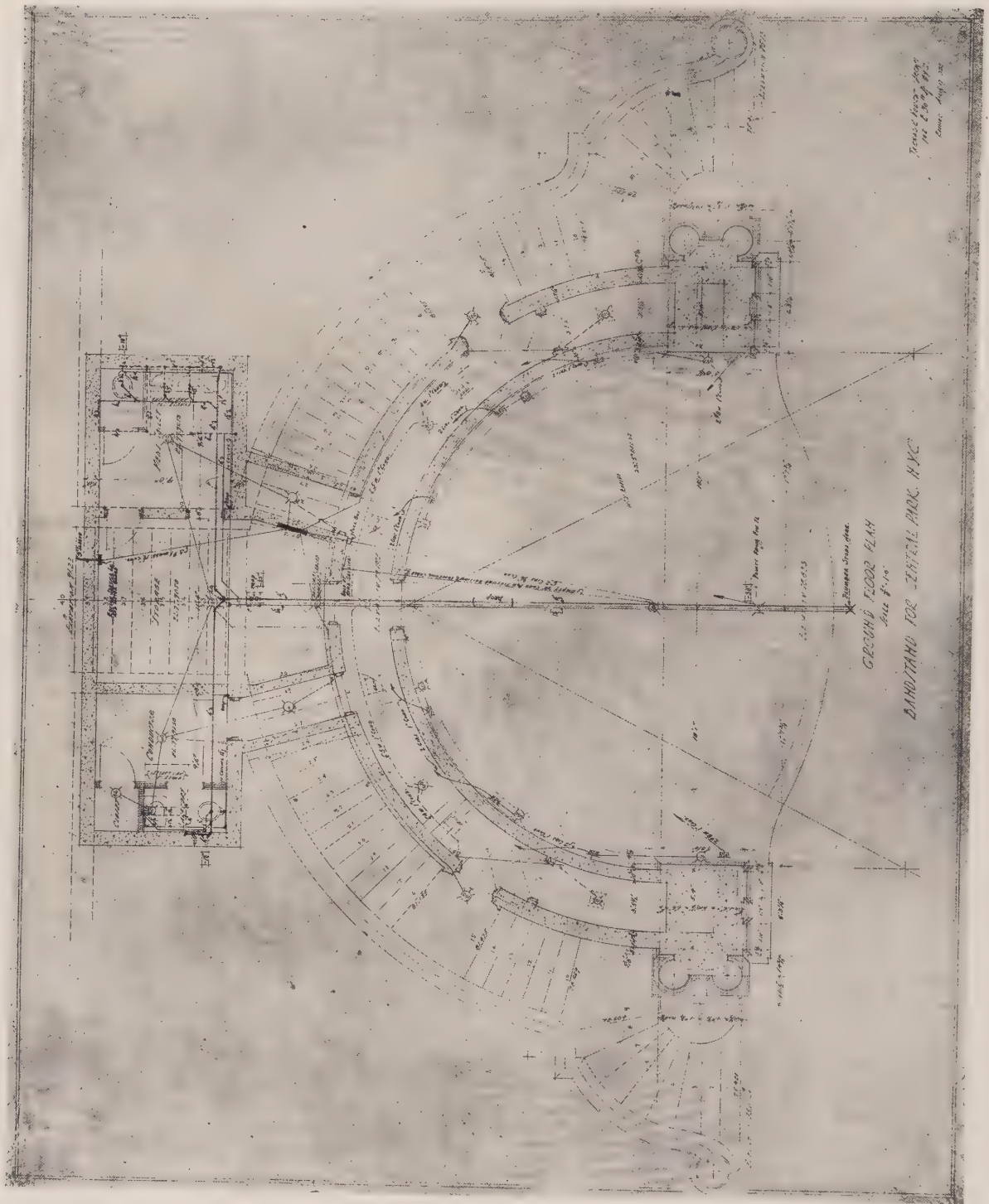
In the men's section there should be as many urinals as there are water closets. In the women's section there should be a mirror on the wall over the wash basin and a small shelf under the mirror, upon which a woman can lay her purse, vanity case, etc., while washing her hands.

Animal houses should be roomy, well and soundly built of good materials and so planned that they provide the right accommodations for the particular kinds of animals they are intended to house. The director of the zoo or a member of his staff is the best source of information. The comfort and well-being of the animals and ease and safety in viewing them, on the part of visitors,

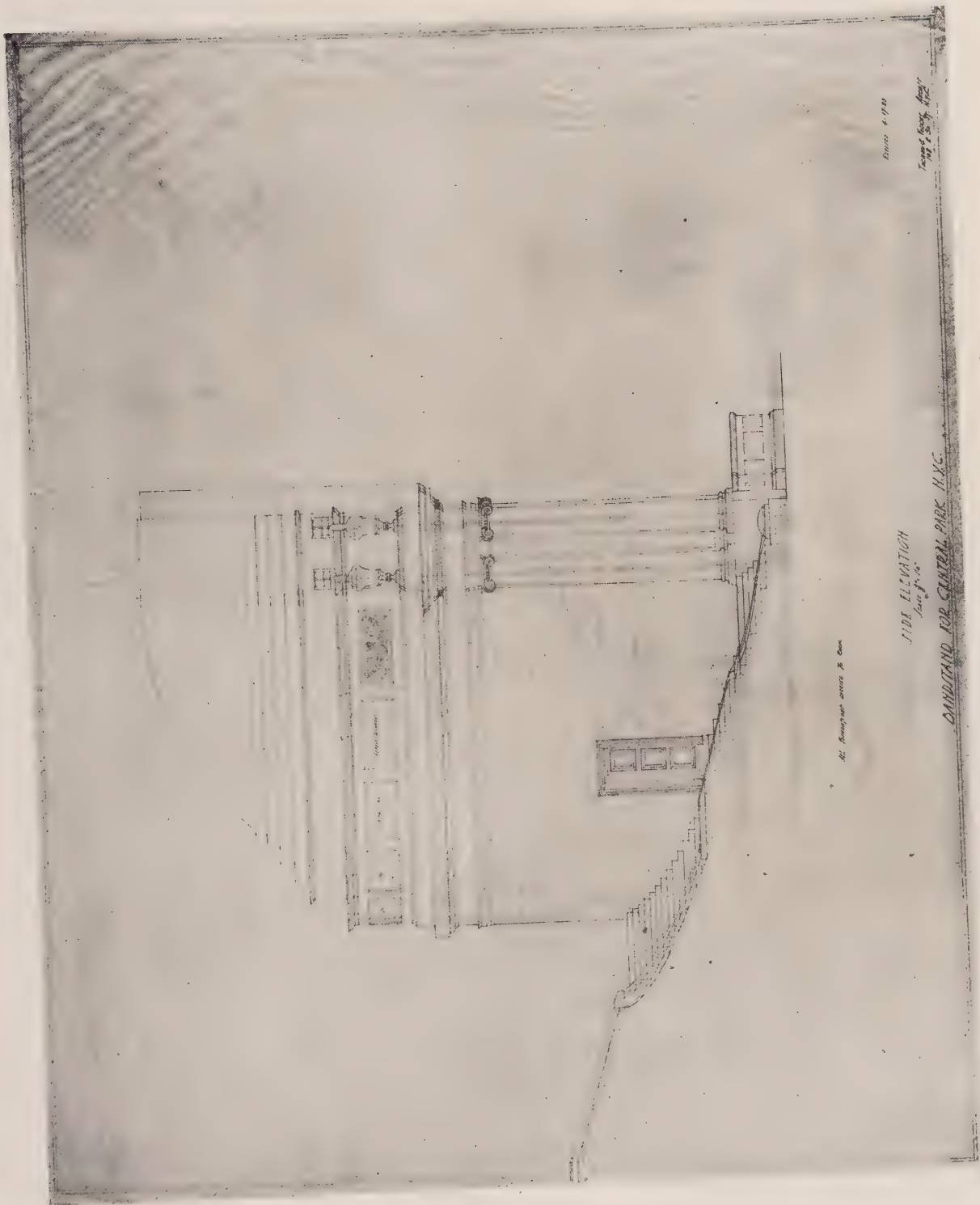
(Continued on page 223)



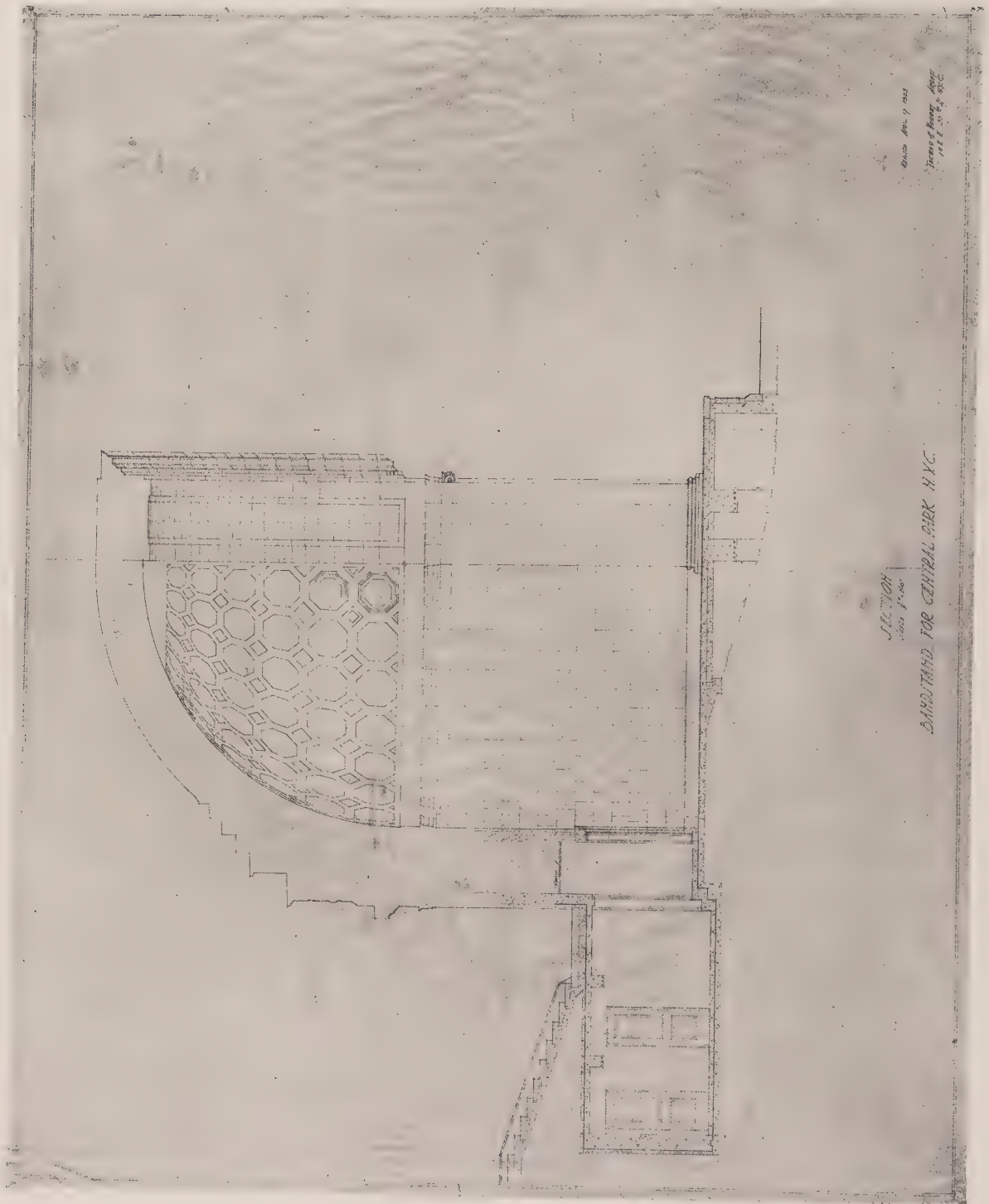
Basement Plan, Bandstand for Central Park, New York City
Tachau & Vought, Architects



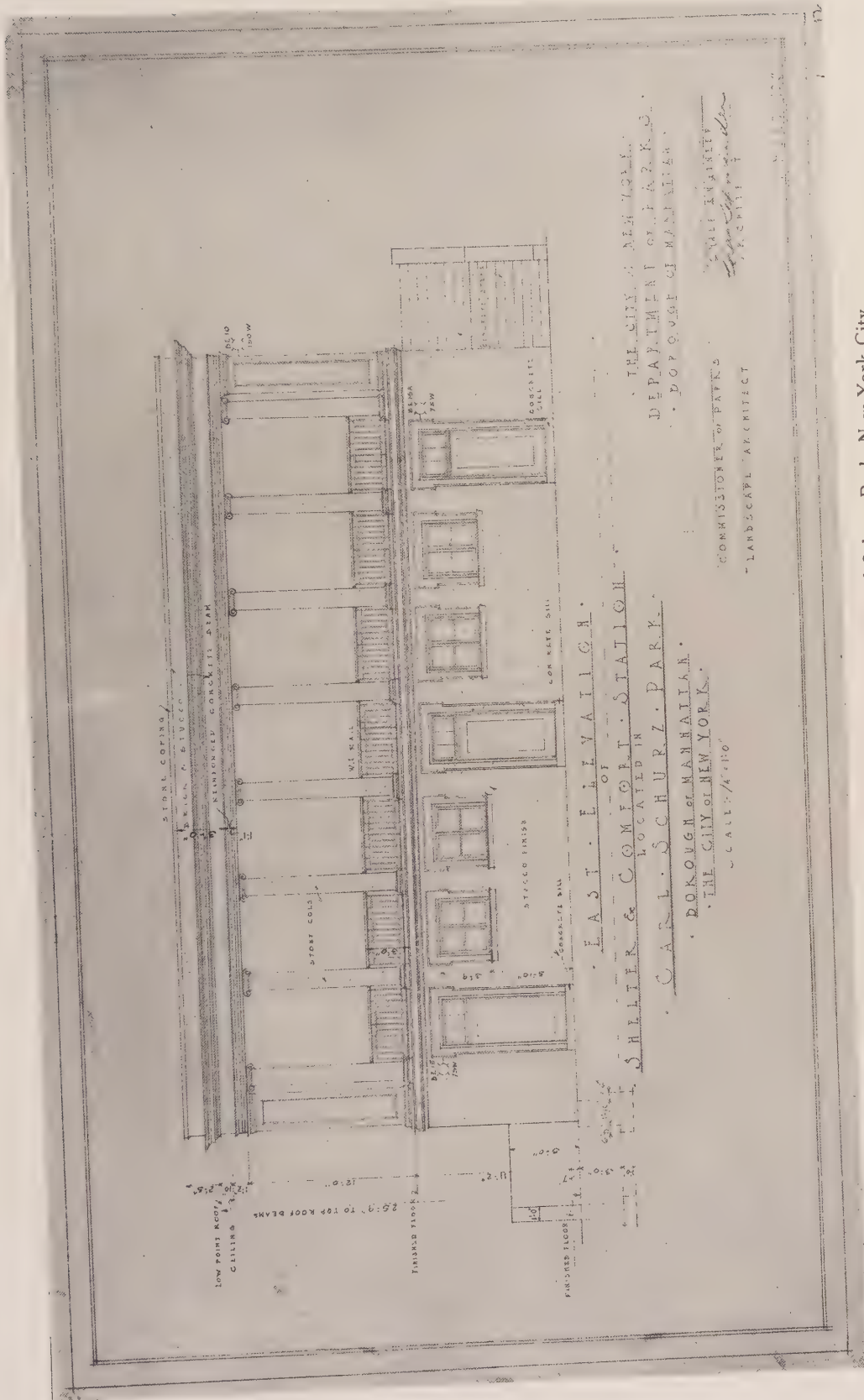
Ground Floor Plan, Bandstand for Central Park, New York City
 Tachau & Vought, Architects



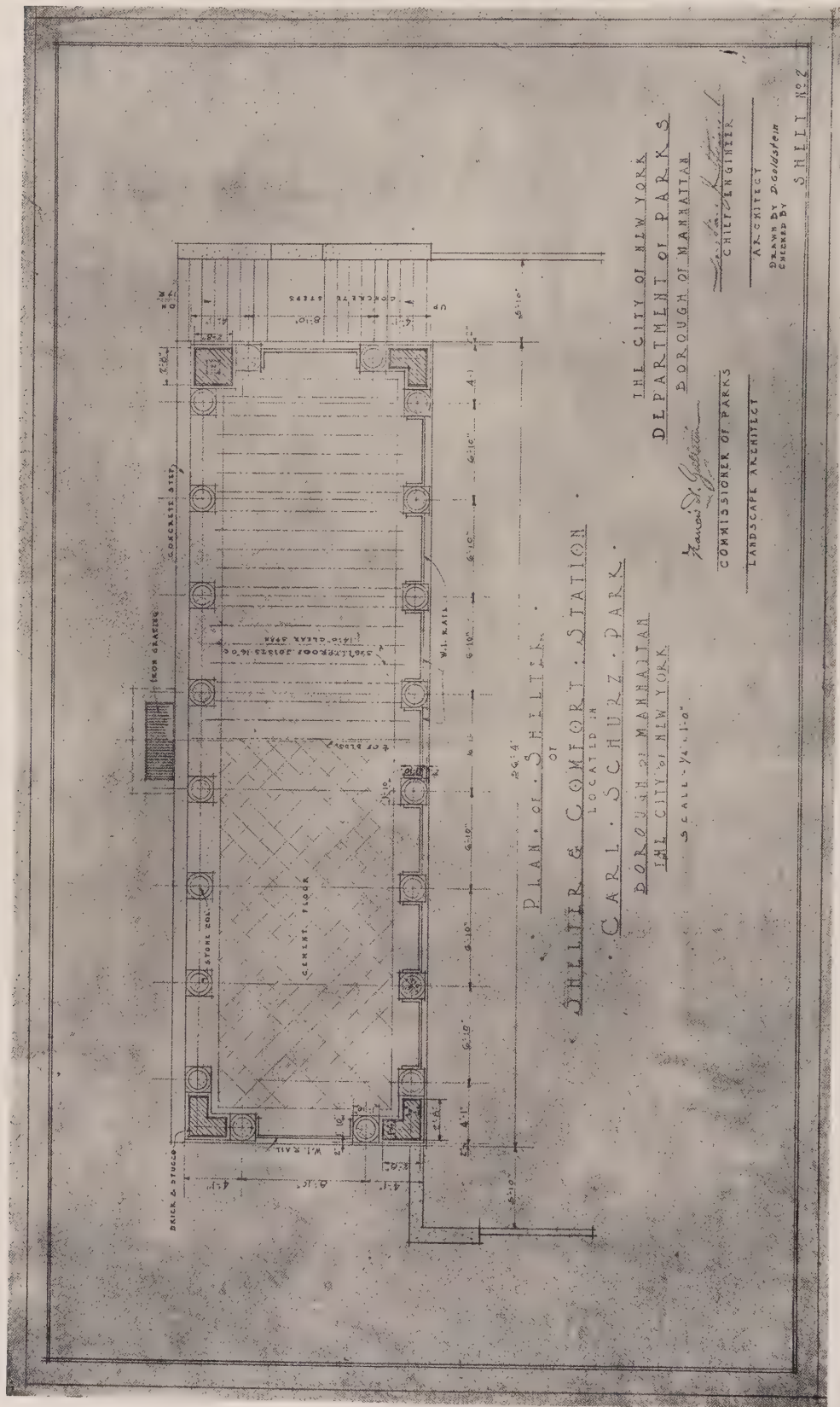
Side Elevation, Bandstand for Central Park, New York City
Tachau & Vought, Architects



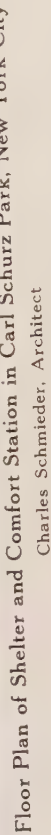
Section, Bandstand for Central Park, New York City
Tachau & Vought, Architects

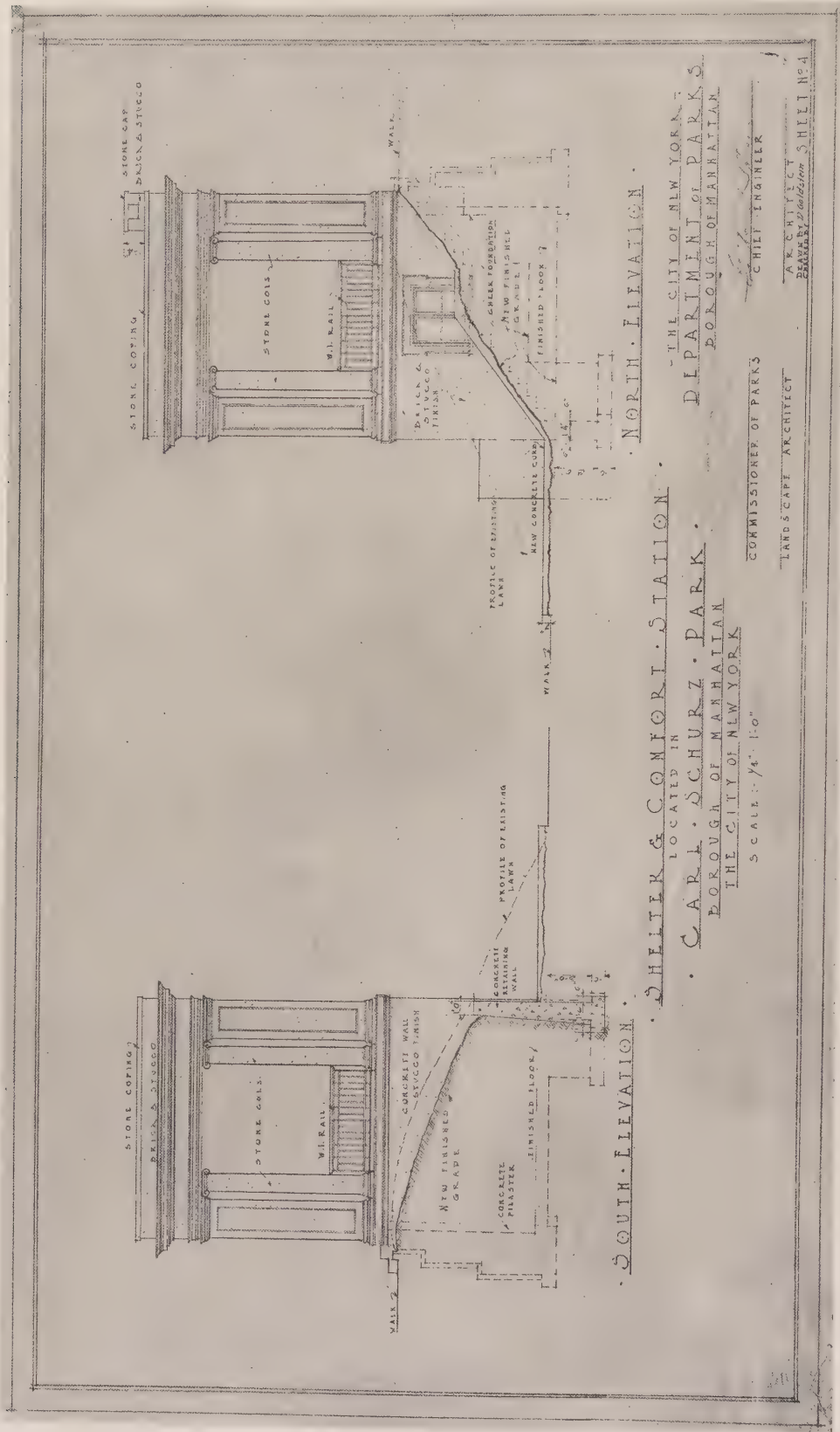


East Elevation of Shelter and Comfort Station in Carl Schurz Park, New York City
Charles Schmieder, Architect

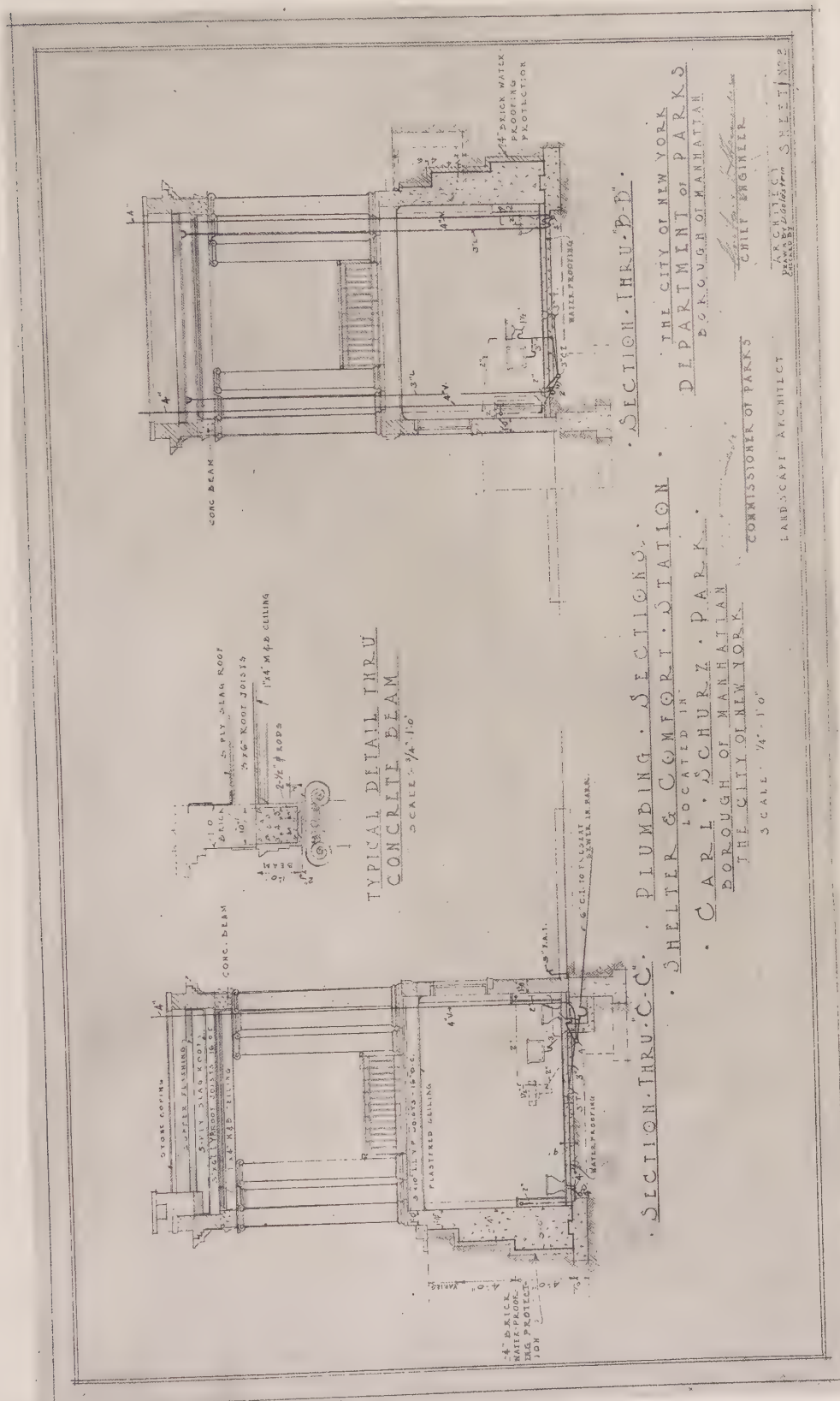


Plan of Shelter and Comfort Station in Carl Schurz Park, New York City
 Charles Schmieder, Architect

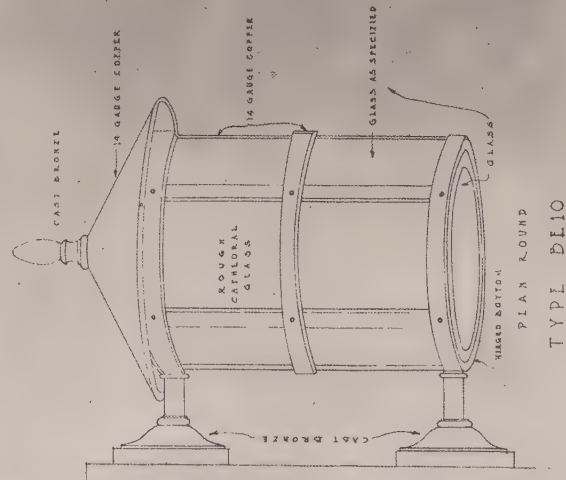




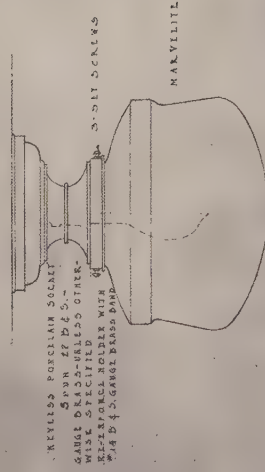
Elevations of Shelter and Comfort Station, in Carl Schurz Park, New York City
Charles Schmieder, Architect



Sections, Shelter and Comfort Station in Carl Schurz Park, New York City
Charles Schmieder, Architect



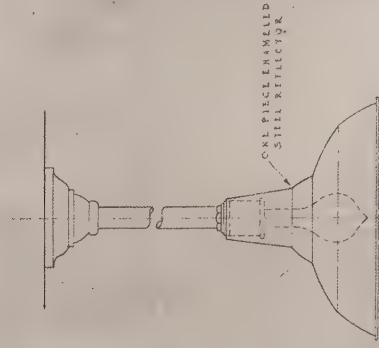
TYPE BL10



TYPE CL97A

DIAMETER	HEIGHT	WEIGHT
5"	4"	6 1/2"
12"	6"	10 1/2"
14"	6"	12 1/2"
16"	6"	14 1/2"

• TYPES OF FIXTURES
• TO BE USED FOR THE
• SHELTER & COMFORT STATION
• IN CARL SCHURZ PARK.

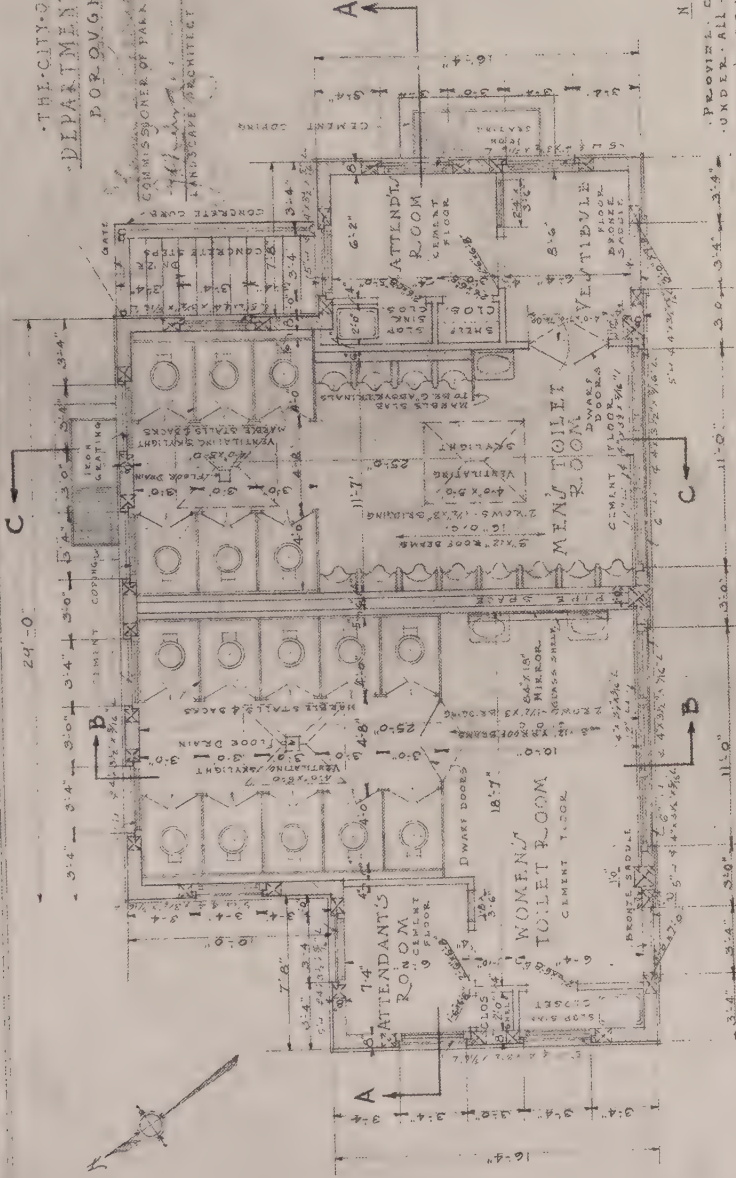


TYPE CO33B

TRACED BY D. G. S. S. E.
CHECKED BY

Types of Fixtures, Shelter and Comfort Station in Carl Schurz Park, New York City
Charles Schmieder, Architect

THE CITY OF NEW YORK
DEPARTMENT OF PARKS
COMMISSIONER OF PARKS
CHIEF ENGINEER
LANDSCAPE ARCHITECT



NOTE
PROVIDE CAST-IRON IMPLANTS
UNDER ALL PLATING, INDICATED.
STEEL BEAMS AS INDICATED.

DRAWN BY D. Davidson
CHECKED BY

FLOOR PLAN
COMFORT STATION FOR MEN & WOMEN
IN WASHINGTON SQUARE PARK
BOROUGH OF MANHATTAN
THE CITY OF NEW YORK
SCALE 1/4" = 1'-0"

Floor Plan, Comfort Station in Washington Square Park, New York City
Charles Schmieder, Architect



YOUTH ELEVATION.
COMFORT STATION FOR MEN & WOMEN.
TO BE DIRECTED.
IN WASHINGTON SQUARE PARK.

BOROUGH OF MANHATTAN.
THE CITY OF NEW YORK.

SCALE - 1/4" = 1'-0"

THE CITY OF NEW YORK.
DEPARTMENT OF PAROLE &
BOROUGH OF MANHATTAN.

7-23-50
COMMISSIONER OF PARKS
H. W. W. W.
LANDSCAPE ARCHITECT

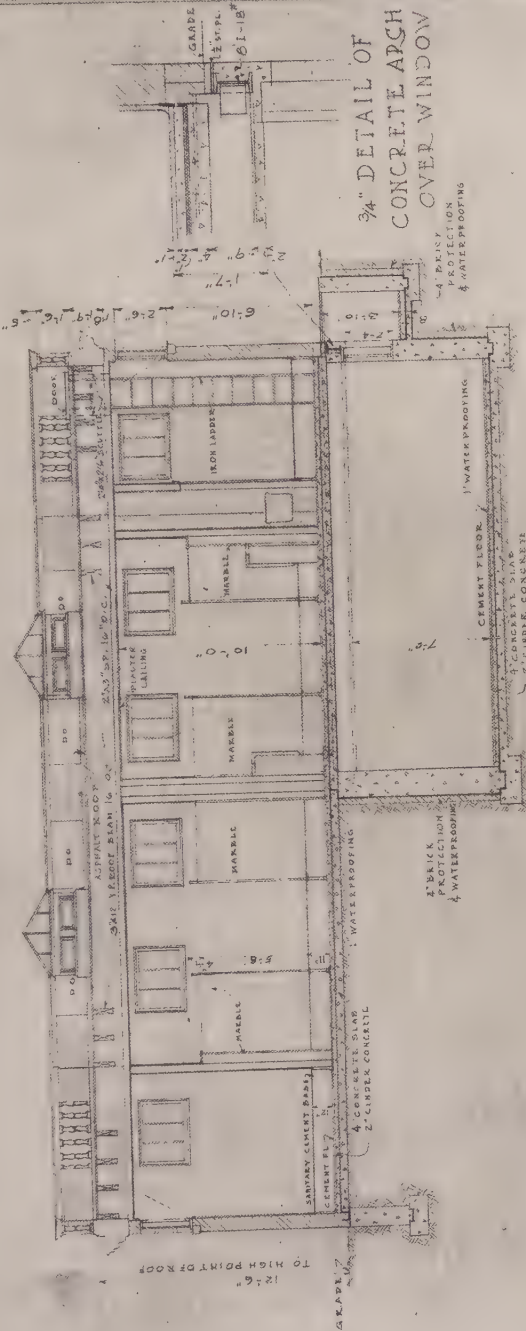
CHIEF ENGINEER

ARCHITECT

DRAWN BY D Goldstein
CHECKED BY

5

South Elevation, Comfort Station in Washington Square Park, New York City
Charles Schmieder, Architect



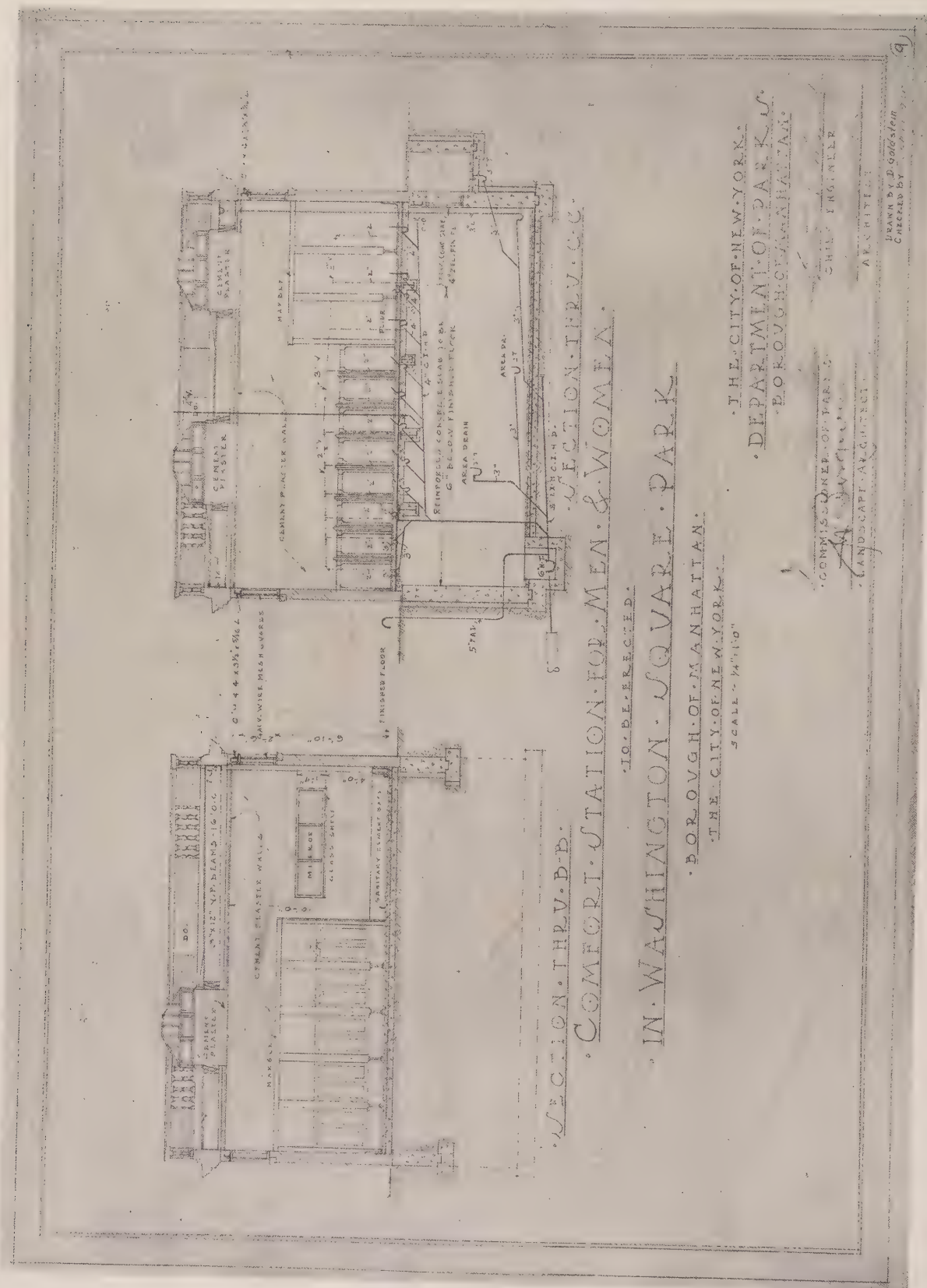
SECTION THRU A-A
COMFORT STATION FOR MEN & WOMEN
TO BE ERECTED

IN WASHINGTON SQUARE PARK
BOROUGH OF MANHATTAN
THE CITY OF NEW YORK

DEPARTMENT OF PARKS
LANDSCAPE ARCHITECT
ARCHITECT
CHIEF ENGINEER
DEAN
CHIEF DESIGNER

SCALE 1/4" = 1'-0"
COMMISSIONER OF PARKS
LANDSCAPE ARCHITECT
ARCHITECT
CHIEF ENGINEER
DEAN
CHIEF DESIGNER

Section, Comfort Station in Washington Square Park, New York City
Charles Schmieder, Architect



Sections, Comfort Station in Washington Square Park, New York City
Charles Schmieder, Architect

are the main general considerations. Safety and convenience of attendants in caring for the animals must also be kept in mind. Worn out, cheaply built, or badly designed animal houses are costly as well as a disgrace to the city that permits them in its parks. They are costly in that the lack of proper housing causes the death of many valuable animals. They are a disgrace because of the inhumanity of confining animals in quarters in which they slowly decline in health. The animals in a zoo are kept there for the pleasure and instruction of the children of the city. The pleasure is lessened if not completely spoiled when the animals, or any of them, are clearly not well and happy, and the depletion of the collection in a zoo, through the death of specimens, reduces its educational value, naturally.

One of the best animal houses, since it measures up to the requirements admirably, is the Lion House in the Bronx Park, New York City. Though this Lion House is not a new building, it would be difficult, in the writer's opinion, to improve upon it. The requirements were so well studied and well met and the materials and construction were so sound that it may be regarded as a model for a structure of this kind today.

The arrangement of the cages along an aisle of ample width, that extends the length of the building, permits the stream of visitors to pour through the house, in at one end and out at the other, and

on Sundays and holidays the crowd is very large.

The ceiling is high and the place is light and airy; this is important both for comfort and for the public health, when there are crowds, and more pleasant especially where animals are housed, regardless of how clean their quarters may be kept. There is a row of large windows in the wall opposite to the cages.

The cages are roomy and they are furnished with shelves on the walls or other resting places of the kinds the animals like. Furthermore, the animals are not confined to a single space, but they can vary the monotony of their lives by occupying in turn the cage and the strongly enclosed yard upon which each cage opens at the back. The connection between the cage and the yard is made, in the case of the lions and other big cats, by a short tunnel of rock work—part of the naturalistic rock work that relieves the outdoor space of barrenness and that helps to make it interesting to the public and to the animal alike. This plan affords the animal a kind of privacy and he can at least enjoy the change of being stared at by a different crowd by simply passing back and forth through the grotto-like tunnel. Then, too, there are tree trunks with branches to climb upon, as well as the rocks. This gives the animals something that approaches, or at least suggests, the nature of their surroundings in a wild state and it also affords the means for needed exercise.



Memorial Library, Bellport, L. I., N. Y.



North Portland Branch Library, Portland, Oregon



Genesee Branch Library, Rochester, N. Y.



Public Library, Gresham, Oregon



Shawnee Branch Library, Louisville, Ky.



East 79th Street Branch Library, Cleveland, Ohio

Types of Public Libraries

From "The Library Building" by Chalmers Hadley, courtesy of the American Library Association.

CHAPTER XV

PUBLIC LIBRARIES AND MUSEUMS

IT HAS long been the custom for the architect to design public libraries in a monumental manner, even when they have been small libraries. This has come about largely through the feeling that prevailed on the part of the public that the library was primarily an ornament to the city, or to the section of the city in which it was built. Its usefulness for a long while has been regarded as a secondary consideration by everyone excepting the library authorities and library workers.

As a consequence of this, many library people have a deep-seated distrust of the architect. Unless they have reason to believe otherwise, they are prone to assume that he will sacrifice many of the important practical considerations to an unreasonable desire for monumental effect.

It is consequently of more than usual importance for the architect to familiarize himself with the present-day working library requirements, and with the attitude that now prevails on the part of library people in regard to the purpose of a library in a community. From the highest authority down to the earnest but humble employee, men and women engaged in the work of our public libraries today look upon their work as a public service and upon the library as means of service. This idea controls the choice of the location, the character of the building, its layout and its equipment. It was formerly the custom to choose a site for the public library in a good residential district, where the architecture of this building would have a setting of well kept lawns and attractive homes. This is now regarded as the most undesirable location, usually. With the pres-

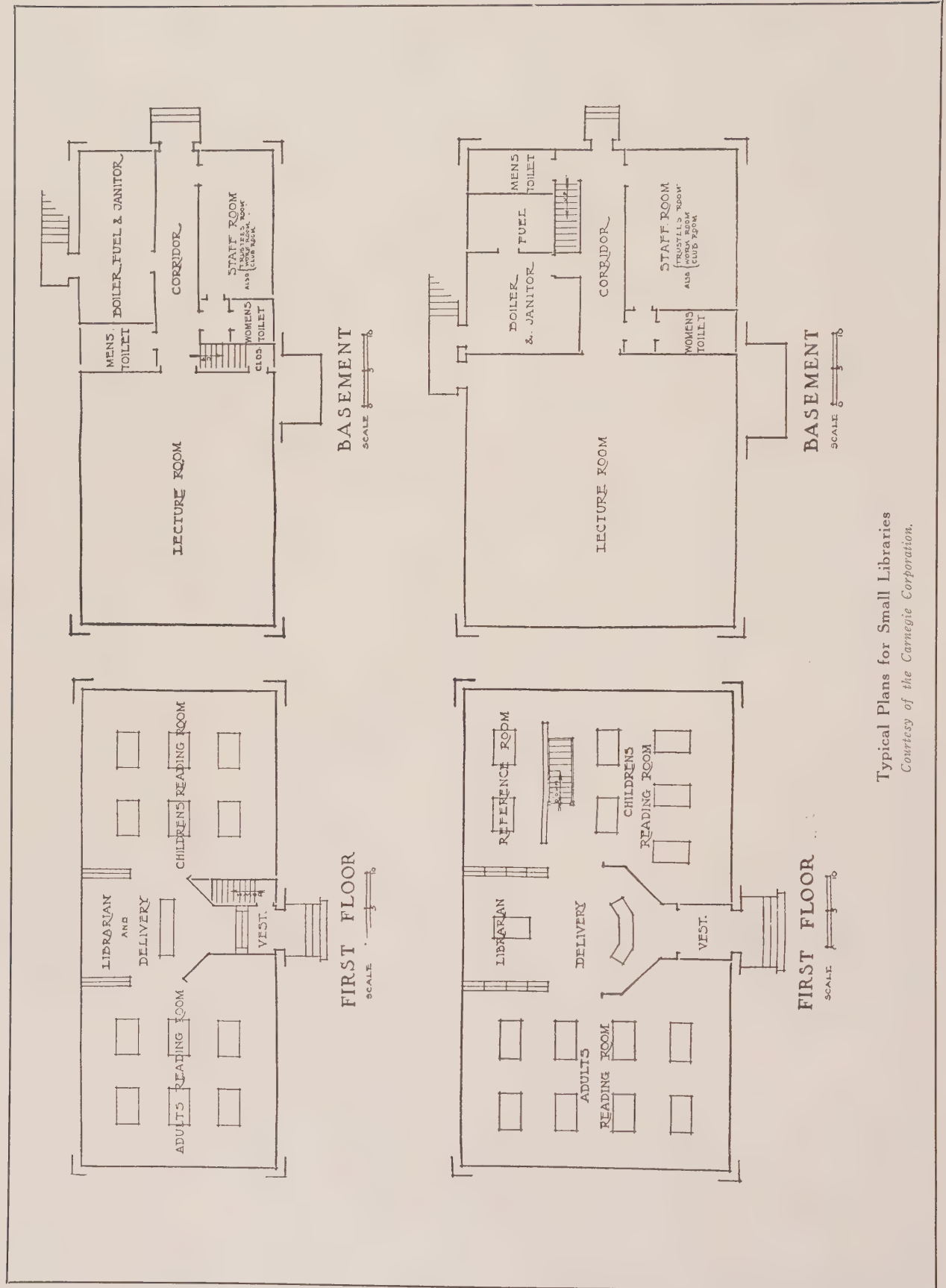
ent-day conception of the library as an instrument of service to the public, the library is brought to the people—not placed in a remote corner of the city. Library people are not indifferent as to whether people ever come to the library or not. The first thing they think of in choosing a location is to secure a site where the greatest number of people pass. For a library this means, as it means for a store, the business center of the city. If there are to be more libraries than one in the city, each serving a section, their location in their sections is chosen with the thought of accessibility. The idea of service has brought the library out to the streetline in many cases, instead of having it set back with a lawn in front of it. It also has brought it down to the street level, or nearly so, instead of being reached by means of imposing stone steps. The same thought is back of the idea of using big windows through which the public can see into the interior of the library, when it is on the streetline, and of windows in which displays of books can be made—show windows, for by these means the library is brought to the public and people are brought into it.

Not infrequently a temporary library building is erected on a chosen site in order that the correctness of the location may be tested before a permanent building is put up. How much a good location means to the present-day library and how little depends upon any monumental character is clearly shown by the fact that one of the most successful libraries, for its size, in the country is a very small one, built much like a gas station and set down in a public square in one of our larger cities. The idea that a library is a place



Bulletin Board with Book Trough
Courtesy of the American Library Association.

THE PRACTICAL REQUIREMENTS

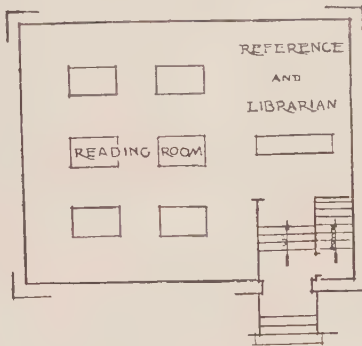


Typical Plans for Small Libraries
 Courtesy of the Carnegie Corporation.

OF MODERN BUILDINGS

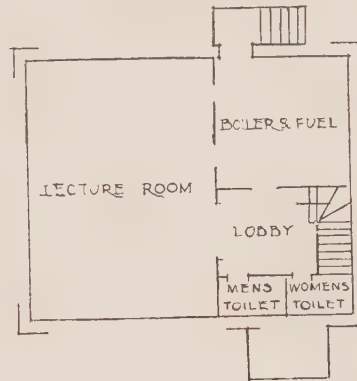
FIRST FLOOR

SCALE 0 5 10



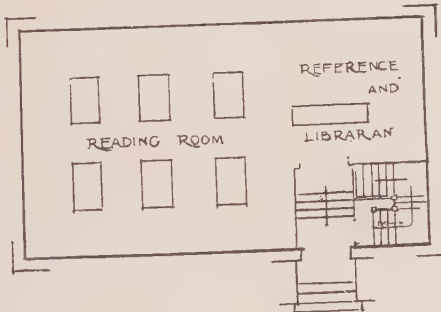
BASEMENT

SCALE 0 5 10



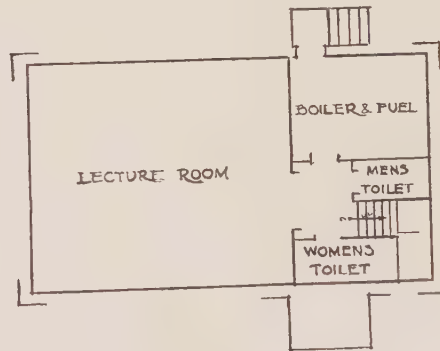
FIRST FLOOR

SCALE 0 5 10



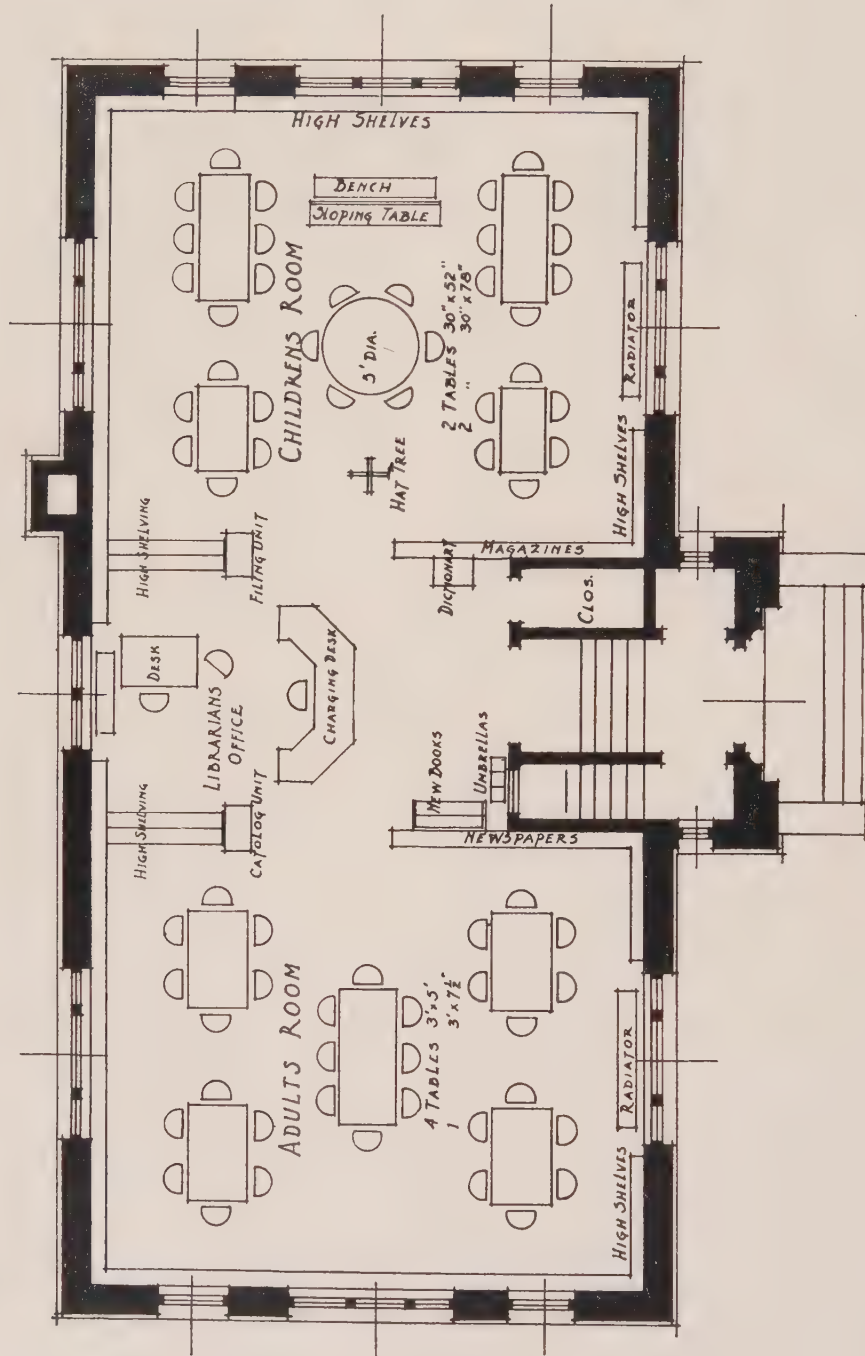
BASEMENT

SCALE 0 5 10



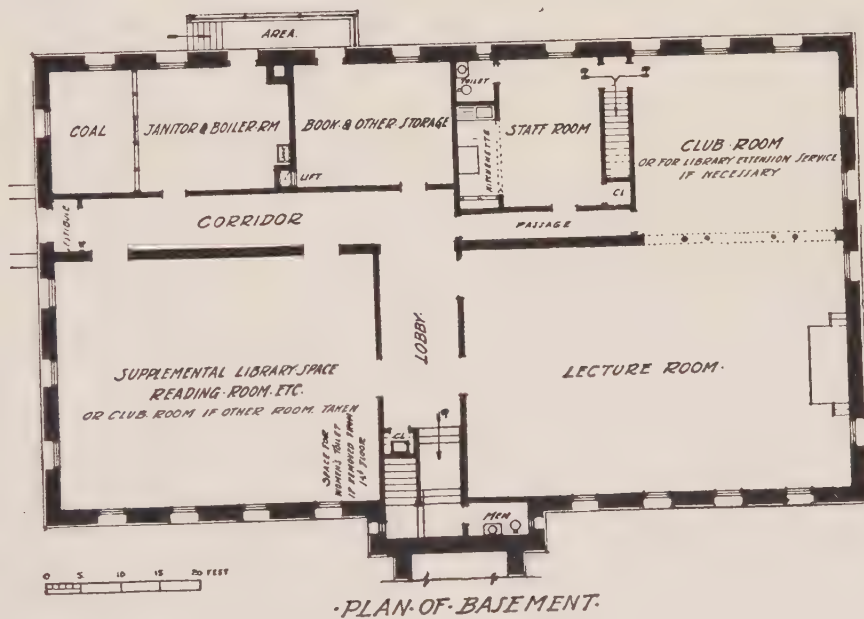
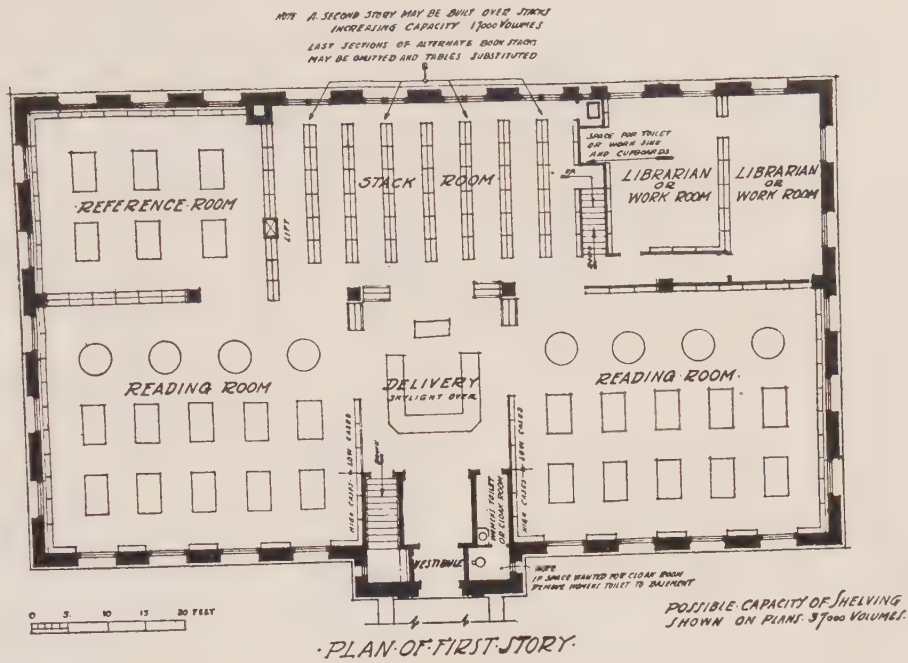
Typical Plans for Small Libraries
Courtesy of the Carnegie Corporation.

THE PRACTICAL REQUIREMENTS



Plan of a Small Library with Its Furniture
 Courtesy of the American Library Association.

O F M O D E R N B U I L D I N G S



Plans for a Public Library to Have a Capacity of Thirty-seven Thousand Volumes
Courtesy of the Carnegie Corporation.



Design for a Small Museum
Edgar A. Josselyn, Architect

From "Manual for Small Museums," Copyright by Laurence Tail Coleman.



Libbey Museum, Wolfesboro, N. H.



Staten Island Public Museum

in which to keep books has been outgrown. The books should be in the hands of readers and the library provides the means of circulating them, housing them only for the purpose of making them available to the public.

Since the typical plans for small libraries prepared by the Carnegie Corporation are regarded as the best obtainable, they are printed here by permission. They are self-explanatory.

One of the most important pieces of library equipment is the bulletin board, and one that is properly designed is shown in the illustration on page 225 by courtesy of the American Library Association. It will be noted that it contains space for posters announcing some of the newest books and, below, a trough in which new books that it is desired to bring to the attention of the public may be placed, so that they may be examined readily by visitors to the library.

From a valuable booklet, "The Library Building," by W. R. Eastman, which is published by the American Library Association, we quote the following useful data: "The common library shelf is a yard long, or a trifle less if three feet are measured from center to center of the uprights. If the shelf is longer than this, it is liable to bend under weight. The standard shelf space is 10 inches high and 8 inches deep. This will receive all books of octavo size or less. For larger books, a space 12 in. x 12 in. or a still higher space should be provided at the bottom of the case, or in special cases. Shelves of standard size should be placed in sections of seven shelves each. These sections set side by side constitute a case, and cases may either be set against the wall or stand

free on the open floor to hold books on each side. Shelves may be of wood or of light steel. One foot of shelf space is long enough for ten books of average thickness to stand side by side, but the practical capacity of each foot under library conditions is seven books. As each bookcase is seven shelves high, each running foot along the wall will provide for about 50 books and each foot in a free-standing floor case, having two sides, will answer for 100 books. Thus, for 200 books we shall need 12 feet in a floor case or 24 feet in one along the wall."

The design for a small museum, shown on page 230, reveals one of the practical requirements of a small museum, namely wall space for the placing of exhibits—that is the reason the windows are frequently placed high in the wall, as they are in the design illustrated. The continuity of this row of windows suggests that they light one large room and that is the fact. An exhibition room that is as large as possible is the main requirement of a small museum. In addition to the exhibition room, there should be a library for books relating to the class or classes of subjects to which the museum is devoted. There should also be a classroom and a directors' room with space for the study of collections. There may be a lecture hall in the basement, also the boiler room, receiving room, a vault, a storage room, and toilet rooms. There is an excellent book devoted to the thorough discussion of this subject. The title is "Manual for Small Museums," and the author is Laurence Vail Coleman, Executive Secretary of the American Association of Museums.

